FINDING OF NO SIGNIFICANT IMPACT
EXPAND RV STORAGE LOT
UNITED STATES AIR FORCE ACADEMY, CO

PROPOSED ACTION: The United States Air Force Academy (USAFA) proposes to expand the current RV Storage Lot from 275,958 square feet (ft2) to 460,269 ft2 and increase parking slots from 398 to 664. The expansion would require removing the current chain-link fence enclosing the RV Storage Lot, grading additional areas, and installing a new chain-link fence. The RV Storage Lot would not be paved; it would be covered with compacted gravel road base. The proposed project would lie outside the boundaries of the 100-year floodplain and Preble's Meadow Jumping Mouse (PMJM) habitat. Trees would be planted along the east side of the RV Parking to block views from the east.

PURPOSE AND NEED: The purpose of this proposed action is to expand the current RV storage lot in the Base Service and Supply Area. The proposed development will yield 266 additional parking spaces based on 693 ft^2 per space in a blend of 10- to 40-foot spaces.

NO ACTION ALTERNATIVE: The No Action alternative would leave the existing site unchanged. An existing waiting list would still exist, and the needs of the RV Storage Lot customers would not be met. Environmental conditions would remain the same as those currently experienced at the site.

SUMMARY OF FINDINGS FOR THE PROPOSED ACTION:

Air Quality. Fugitive dust from ground disturbing activities and combustive emissions from construction equipment would be generated during site clearing and road construction. Air pollutant emissions would be short-term and localized, and would not result in any adverse effects on overall ambient air quality. However, compliance with the El Paso County Construction Permit requires site watering or other dust control measures to ensure particulate emissions would not leave the construction site. No chemical products would be used to control dust.

Operations and Airspace. The proposed project area lies outside the designated clear zones for airfield operations. Construction or operation of the facilities would not cause projections into airspace that pose hazards to aircraft.

Biological Resources. Limited vegetation would be lost if the Proposed Action were implemented. Areas are sparsely covered with native grass. No threatened or endangered species habitat would be lost from implementing the Proposed Action.

Cultural Resources. No cultural resources would be adversely affected by the Proposed Action. However, to maintain compliance with the National Historic Preservation Act, trees must be planted along the east side of the RV Parking Lot to screen the area from view. This action would improve cultural resources by providing more screening for the existing lots.

Geology and Soils. The proposed project would change soil surface characteristics within the RV Storage Lot because the surface would be covered by compacted gravel. The surface would become less permeable; however, the underlying structure would retain its existing characteristics. No other changes to soil would result from implementing the Proposed Action. Loss of permeability would be minimized by appropriate storm water BMPs.

Hazardous Materials and Wastes. Potential for spills and leaks of fuels, oils, and coolants from construction equipment would increase during the construction period. However, USAFA's Overarching Environmental Specifications and the Construction Permit require contractors to maintain a spill control plan to prevent releases into the environment. The USAFA Environmental Flight responds to spills and maintains cleanup capability. Spills occurring during construction

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE **18 SEP 2006**	2. REPORT TYPE	3. DATES COVERED **00-00-2006 to 00-00-2006**

4. TITLE AND SUBTITLE **Finding of No Significant Impact: Expand RV Storage Lot United States Air Force Academy, CO**	5a. CONTRACT NUMBER 5b. GRANT NUMBER 5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER 5e. TASK NUMBER 5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **10 Civil Engineer Squadron (45 CES/CEV),8120 Edgerton Drive,USAF Academy,CO,80840**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S) 11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT
The United States Air Force Academy (Academy) has prepared this Environmental Assessment (EA) to assess the potential environmental effects resulting from expanding the recreational vehicle (RV) storage lot located in the Academy's Base Service and Supply Area. The 1Oth Services Division (Services) operates the RV storage lot to serve active-duty and retired Air Force military personnel. The No-Action Alternative would be to not expand the parking lot.

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT **unclassified**	b. ABSTRACT **unclassified**	c. THIS PAGE **unclassified**	**Same as Report (SAR)**	**102**	

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Prescribed by ANSI Std Z39-18

would be cleaned up immediately upon discovery. This action would not utilize hazardous materials as defined by AFI 32-7086 or generate hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA).

Land Use. The proposed project would be located within the Base Service and Supply Area, which is designated for industrial use in the USAFA Master Plan. No change in land use would result from implementing this action.

Noise. Increased noise would temporarily exist during the construction phase; however, it would not affect receptors beyond the immediate area of the construction site. The nearest off-site receptor is an isolated private dwelling located about 1,000 feet southwest of the southern limit of the proposed construction area.

Water Resources. The Proposed Action would improve the quality of storm water runoff from the southern part of the RV Parking Lot because post-construction storm water BMPS would be implemented. Past construction of the RV Parking Lot and vehicle impound lot in this area did not include storm water BMPs. Implementation of the Proposed Action would return storm water peak flow runoff rates to pre-development conditions.

Environmental Justice. Local contractors would construct this project, which would provide a temporary benefit to the local economy. Concentrated areas of low-income, minority, or disadvantaged residents do not exist within USAFA or within a five-mile radius of the approximate center of the Academy grounds. No disproportionately high minority populations exist within these areas.

CUMULATIVE IMPACTS: The environmental assessment (EA) reviewed cumulative impacts that could result from the incremental impact of the action when added to other past, present, or reasonably foreseeable future actions. With incorporation of specific design features and best management practices, cumulative impacts that would result from the Proposed Action would not be considered significant.

MITIGATION: No mitigation measures are required for the Proposed Action. Although no mitigation is required, specific design features and best management practices will be implemented to prevent or minimize the potential for environmental impacts. Specific mitigation measures identified as a result of regulatory permit requirements will be incorporated into design and construction.

DECISION: Based on the EA conducted in accordance with the National Environmental Policy Act, the Council on Environmental Quality regulations, and implementing regulations set forth in 32 CFR 989 (Environmental Impact Analysis Process), the United States Air Force Academy concludes that, with incorporation of best management practices for resources as described herein as well as incorporation of specific regulatory permit requirements, the environmental effects of the proposed RV lot expansion, are not significant, and that preparation of an environmental impact statement is not warranted. For these reasons, a finding of no significant impact is made. An EA, dated August 2006, is hereby incorporated by reference, and is on file at 10th Civil Engineer Squadron, Environmental Flight, 8120 Edgerton Road, Ste. 40, US Air Force Academy Colorado 80840 ATTN: Environmental Planner.

APPROVED:

Jimmy E. McMillian

JIMMY E. MCMILLIAN, Colonel, USAF
Commander, Headquarters 10th Air Base Wing

18 Sep 06
DATE

COVER SHEET ENVIRONMENTAL ASSESSMENT
US Air Force Academy RV Lot Expansion

a. Responsible Agency: Department of the Air Force

b. Proposed Action: Recreational Vehicle Storage Lot Expansion at US Air Force Academy

c. Written comments and inquiries regarding this document should be directed to: Richard Normandie, 10 CES/CEV, 8120 Edgerton Road, Ste. 40, US Air Force Academy Colorado 80840-2400

d. Report Designation: Environmental Assessment (EA).

e. Abstract: The United States Air Force Academy (Academy) has prepared this Environmental Assessment (EA) to assess the potential environmental effects resulting from expanding the recreational vehicle (RV) storage lot located in the Academy's Base Service and Supply Area. The 10th Services Division (Services) operates the RV storage lot to serve active-duty and retired Air Force military personnel. The No-Action Alternative would be to not expand the parking lot.

This EA analyzes the potential environmental impacts from proposed activities on air quality, airspace, biological resources, cultural resources, geology and soils, hazardous materials and waste management, land use, noise, and water resources. The EA also analyzed environmental justice and cumulative impacts of the Proposed Action.

The Academy has determined that the impacts to these resources would not be significant.

Table of Contents

TABLE OF CONTENTS (CONT'D)

Section 1.0

Purpose and Need

The United States Air Force Academy (Academy) has prepared this Environmental Assessment (EA) to assess the potential environmental effects resulting from expanding the recreational vehicle (RV) storage lot located in the Academy's Base Service and Supply Area. The 10th Services Division (Services) operates the RV storage lot to serve active-duty and retired Air Force military personnel. The Services mission statement is "To Contribute to Readiness and Improve Productivity through Programs Promoting Fitness, Esprit de Corps, and Quality of Life for Academy People."

1.1 Background

The existing RV parking lot provides space for 398 vehicles of varying lengths. The term "vehicle" used in this EA refers to both non-motorized travel trailers and motorized RVs. The average space required for each vehicle is 693 square feet (ft^2). Services charges the same fee for all RV spaces, regardless of size. The single fee does not follow the private sector standard of charging more for larger vehicles; however, it simplifies management of the lot and has not reduced demand for storage space (Final Needs Assessment, 2004).

1.2 Purpose and Need

1.2.1 Purpose

The purpose of this proposed action is to expand the current RV storage lot in the Base Service and Supply Area. The proposed development will yield 266 additional parking spaces based on 693 ft^2 per space in a blend of 10- to 40-foot spaces.

1.2.2 Need

A needs analysis conducted for Services identified a need for additional RV storage because demand outweighs available storage space. The Needs Assessment and Study that was finalized in February 2004 shows 210 people on the current waiting list with demand for space continuing into the future. The assessment also revealed many off-base storage lots have waiting lists rather than vacancies. The proposed development would yield 266 additional parking spaces based on 693 ft2 per space in a blend of 10- to 40-foot spaces. The needs assessment can be found in Appendix A to this EA.

1.2.3 Screening Criteria

To evaluate the selection of alternatives to the Proposed Action, the Academy developed screening criteria to select a location to increase RV lot parking capacity and

remain in close proximity to the existing RV Storage Lot. Screening criteria used in the selection process are listed below:

- The expanded RV parking areas must provide a secure facility that meets Air Force standards and satisfy customer demands.
- The RV parking lot expansion must be consistent with the Academy's Master Plan and the Academy's Historic Landmark status.
- Threatened species habitat and 100-year floodplains must be avoided.
- To minimize financial and environmental impacts, the location should maximize use of existing facilities.

The Academy targeted expansion of the existing RV Storage Lot as the most appropriate location for increasing RV storage space because it met the conditions of the screening criteria and offered physical facilities that required minimal alteration.

1.3 Location of the Proposed Action

The proposed project would be constructed within the Base Service and Supply Area near the southern entrance to the Academy. The proposed site lies next to the existing RV Storage Lot east of Monument Creek near the Academy's southwestern boundary. See Figure 1-1 for a map showing the boundaries of the Academy and the proposed project location.

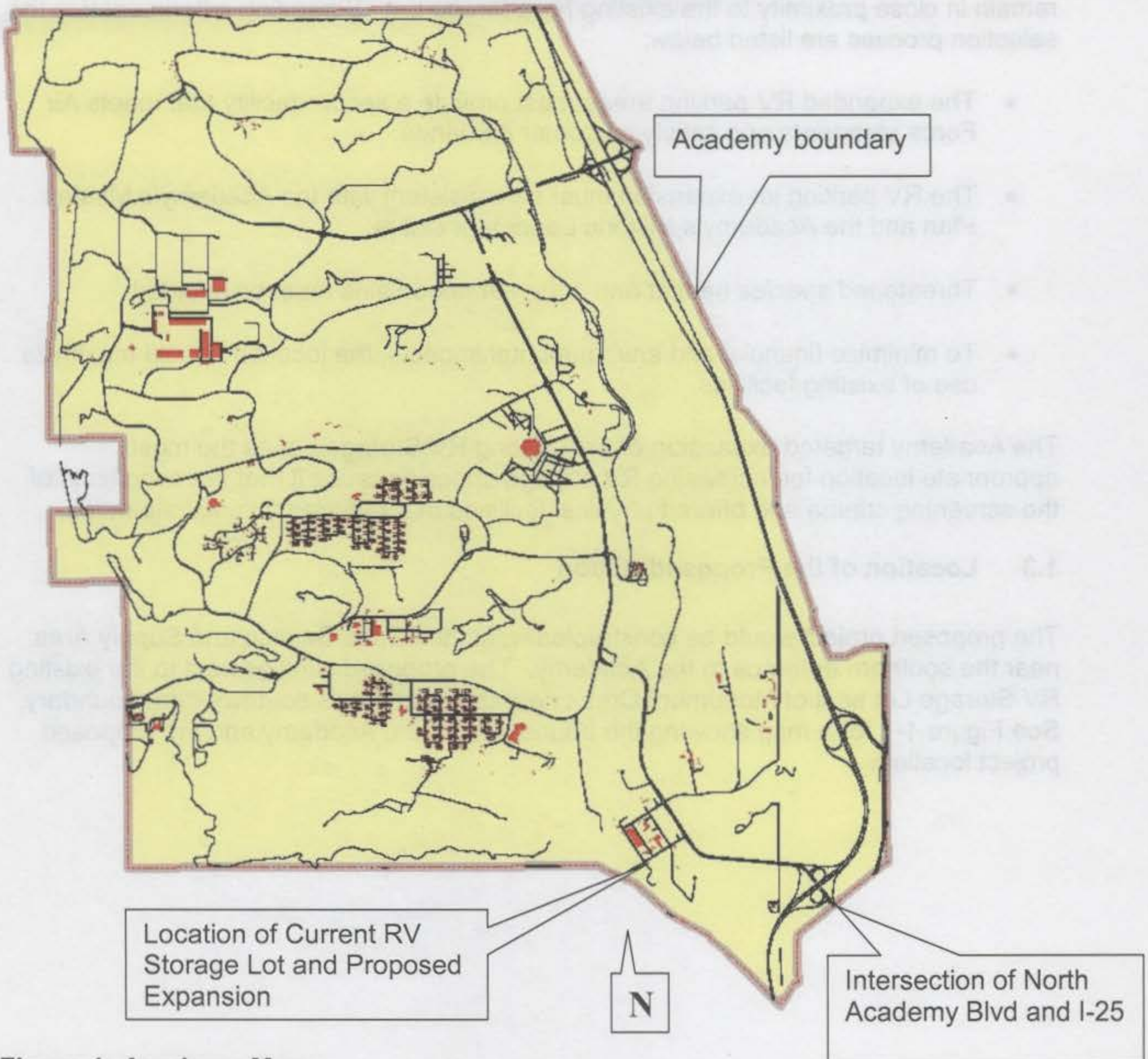

Figure 1: Academy Map

1.4 Decisions to be Made

The Academy must decide whether to construct additional RV storage space at (1) the proposed location, (2) some other location, or (3) take no action.

For any action other than the No Action Alternative, the HQ 10 ABW/CC as chair of the base Environmental, Safety, and Occupational Health Council, will decide whether to

proceed with an Environmental Impact Statement or issue a Finding of No Significant Impact.

1.5 Scope of the Environmental Review

The scope of this EA covers only resources that may be adversely impacted by activities associated construction and operation of additional RV storage. Potential environmental effects generated by these activities could affect air quality, geology, water resources, hazardous materials and wastes, biological resources, and cultural resources. Detailed descriptions of the affected environment and potential environmental consequences relative to these resources are presented in Sections 3.0, *Affected Environment,* and 4.0, *Environmental Consequences*. The Academy examined other resource areas and conditions and found that the Proposed Action would have either no or inconsequential impact. These resource areas include transportation, climate, operations and airspace, noise levels, utilities, land use, and socioeconomics (including environmental justice). Reasons for not addressing these resources are presented in the following paragraphs and are not further discussed in Section 4.0.

Transportation. Existing paved roads serve the RV Storage Lot, and stop signs are appropriately located to control traffic. Traffic congestion does not impact this area of the Academy because it is located away from visitor attractions and concentrated employee work centers. The Cadet Area, Falcon Stadium, Community Center, and housing areas attract most of the day-to-day and special-event traffic.

Climate. None of the proposed activities would affect either short-term weather conditions or long- term climate on the Academy or in the surrounding region.

Operations and airspace. The proposed project area lies outside the designated clear zones for airfield operations. Construction or operation of the facilities would not cause projections into airspace that pose hazards to aircraft.

Noise levels. Increased noise would temporarily exist during the construction phase; however, it would not affect receptors beyond the immediate area of the construction site. The nearest off-site receptor is an isolated private dwelling located about 1,000 feet southwest of the southern limit of the proposed construction area.

Utilities. No electrical, water, sewer, or gas utilities serve the existing RV parking lot, and none are needed for the proposed expansion.

Land Use. The proposed project would be located within the Base Service and Supply Area, which is designated for industrial use in the Academy's Master Plan. No change in land use would result from implementing this action.

Socioeconomics. Local contractors would construct this project, which would provide a temporary benefit to the local economy. However, the benefit would be temporary and minor compared to the overall economy of the region. Executive Order 12898

requires federal agencies to identify and address disproportionately high and adverse human health or environmental effects of activities on minority and low-income populations. Concentrated areas of low-income, minority, or disadvantaged residents do not exist within the Academy or within a five-mile radius of the approximate center of the Academy grounds. Table 1 in Appendix B shows population data from the 2000 Census for the four postal ZIP codes surrounding the Academy. No disproportionately high minority populations exist within these areas.

1.6 Related EAs

Environmental assessments (EA) were conducted for two previous actions involving the RV Storage Lot. EA 93-001 (1993) examined environmental effects of expanding the lot to the west by about 50 percent. Mitigations conducted at that time included installing a detention pond and replacing trees that were removed during construction. The 1993 EA resulted in a finding of no significant impact (FONSI).

EA 97-043 (1998) expanded the lot to the south side of Park Drive and increased total capacity by about 56 percent. Mitigations included installing a shallow storm water diversion ditch and riprap to prevent erosion. The 1998 EA resulted in a FONSI.

1.7 Applicable Regulatory Requirements and Coordination

This environmental analysis has been conducted in accordance with the President's Council on Environmental Quality (CEQ) regulations, Title 40 of the Code of Federal Regulations (CFR) §§1500-1508, as they implement the requirements of the National Environmental Policy Act (NEPA) of 1969, 42 U.S.C. §4321, *et seq.*, and Air Force Instruction (AFI) 32-7061, *The Environmental Impact Analysis Process*, as promulgated in Title 32 CFR Part 989. Title 32 CFR 989 addresses implementation of NEPA and directs Air Force officials to consider environmental consequences as part of the planning and decision-making process. These regulations require federal agencies to analyze the potential environmental impacts of the Proposed Action and alternatives and to use these analyses in making decisions on a Proposed Action. Cumulative effects of other ongoing activities also must be assessed in combination with the Proposed Action. The CEQ was instituted to oversee federal policy in this process. The CEQ regulations declare that an EA is required to accomplish the following objectives:

- Briefly provide sufficient evidence and analysis for determining whether to prepare an Environmental Impact Statement (EIS) or a Finding of No Significant Impact (FONSI).

- Aid in an agency's compliance with NEPA when an EIS is not necessary and facilitate preparation of an EIS when necessary.

AFI 32-7061, as promulgated in Title 32 CFR 989, specifies procedural requirements for the implementation of NEPA and preparation of the EA. This EA also identifies other environmental regulatory requirements relevant to the Proposed Action and alternatives. Regulatory requirements under the following programs, among others, will be assessed: Noise Control Act of 1972; Clean Air Act (CAA); Clean Water Act (CWA); National Historic Preservation Act; Endangered Species Act of 1973; Coastal Zone Management Act; Resource Conservation and Recovery Act (RCRA); Toxic Substances Control Act (TSCA) of 1970; and Occupational Safety and Health Act. Requirements also include compliance with Executive Order (EO) 11988, Floodplain Management; EO 11990, Protection of Wetlands; and EO 12898, Environmental Justice. The following permits specific to the Academy also apply to the Proposed Action:

- El Paso County, Colorado, Air Quality Fugitive Particulate Matter Permit
- National Pollutant Discharge Elimination System (NPDES), General Permit for Construction Activities - COR10000F (Construction Permit)
- NPDES General Permit for Discharges from Small Municipal Separate Storm Sewer Systems Operated by Federal Facilities in Colorado – COR 042000 (MS4 Permit)

1.8 Organization of the EA

The EA is organized into seven sections and three appendices. Section 1.0 contains a statement of the purpose and need for the Proposed Action, defines its location, states the decision to be made, presents the scope of the environmental review, and outlines the organization of the EA. Section 2.0 of the EA describes the Proposed Action and the No Action Alternative and presents a comparison of potential environmental consequences from these alternatives. Section 3.0 describes existing environmental conditions at the proposed project site. These descriptions provide a framework for assessing the potential environmental impacts of the Proposed Action and the No Action Alternative discussed in Section 4.0. Section 5.0 lists the preparers of the EA and persons contacted, and Section 6.0 identifies the persons and agencies consulted in the preparation of the document. Section 7.0 is a list of source documents relevant to the preparation of this EA. Appendices contained in the EA include: Appendix A, Needs Assessment; Appendix B, 2000 Census Data; and Appendix C, Chemical Fate and Transport Documents.

SECTION 2.0

DESCRIPTION OF ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1 Detailed Description of the Proposed Action

The proposed project would expand the current RV Storage Lot from 275,958 square feet (ft^2) to 460,269 ft^2 and increase parking slots from 398 to 664. The expansion would require removing the current chain-link fence enclosing the RV Storage Lot, grading additional areas, and installing a new chain-link fence. The RV Storage Lot would not be paved; it would be covered with compacted gravel road base. See Figure 2 for a description of the proposed project site. Figure 2 also shows the proposed project would lie outside the boundaries of the 100-year floodplain and Prebles Meadow Jumping Mouse (PMJM) habitat. Trees would be planted along the east side of the RV Parking to block views from the east. Figures 3 through 7 show location details of the proposed expansion.

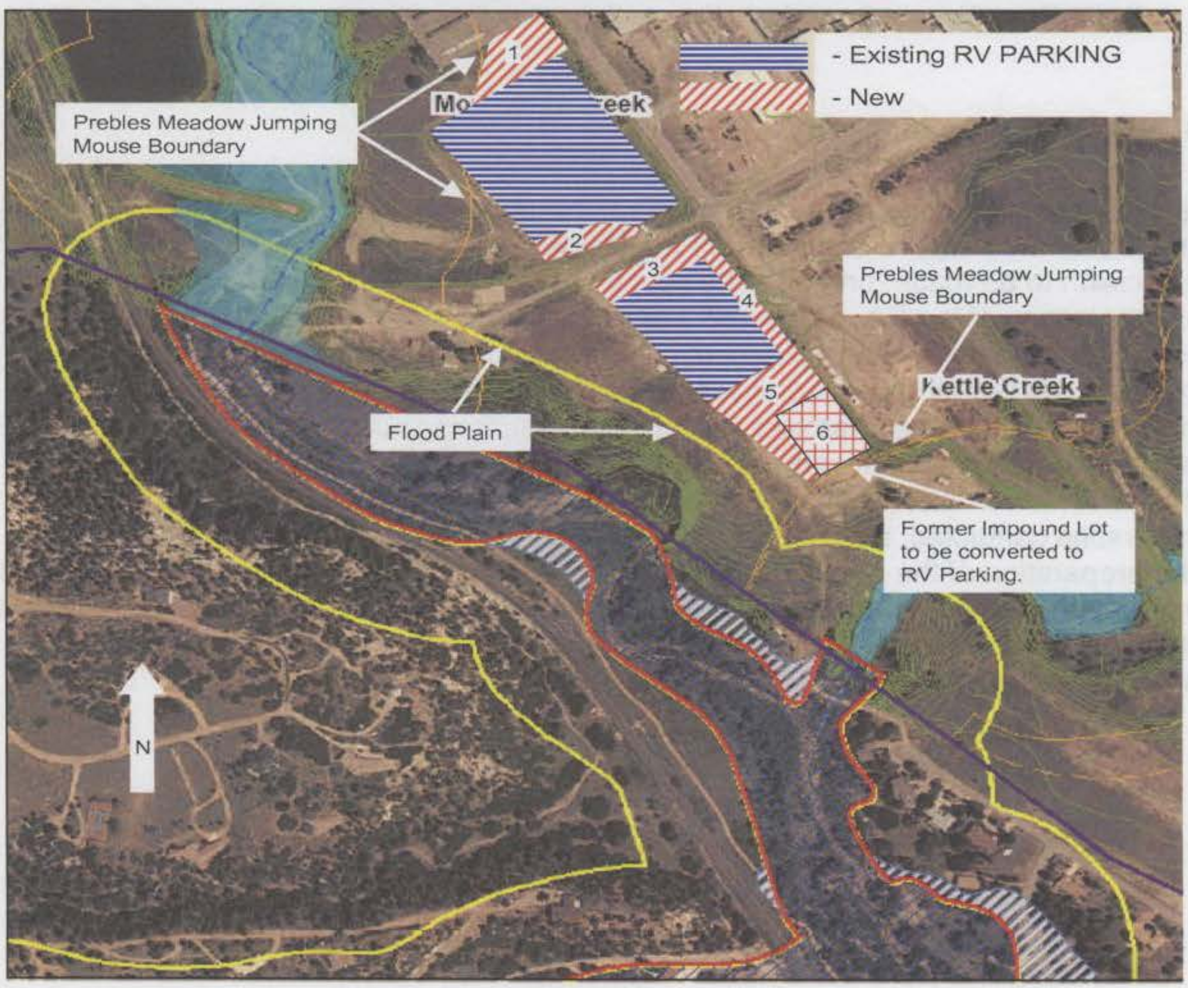

Figure 2: Proposed RV Storage Lot Expansion

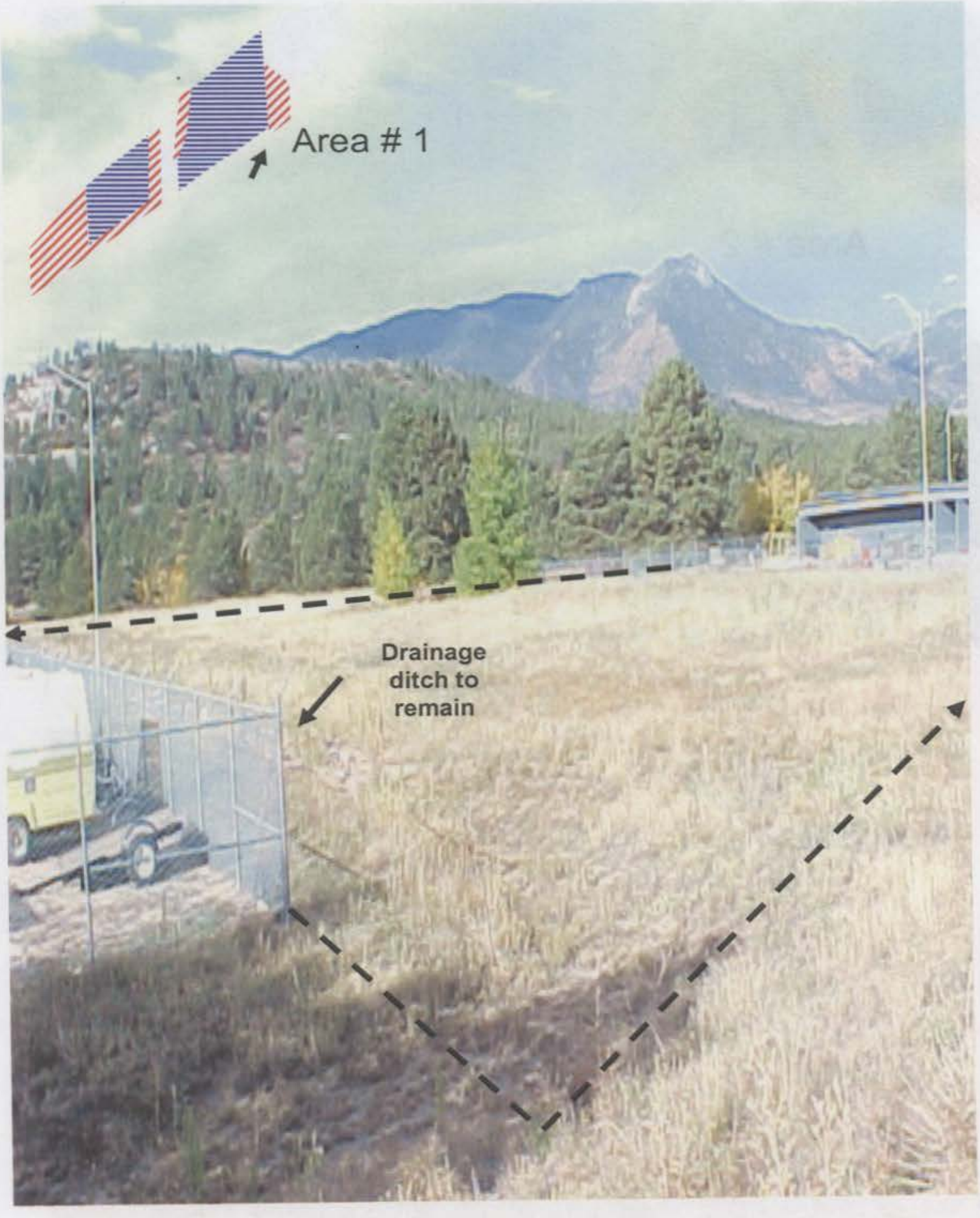

Figure 3: Proposed Expansion Area No. 1 Looking Northwest

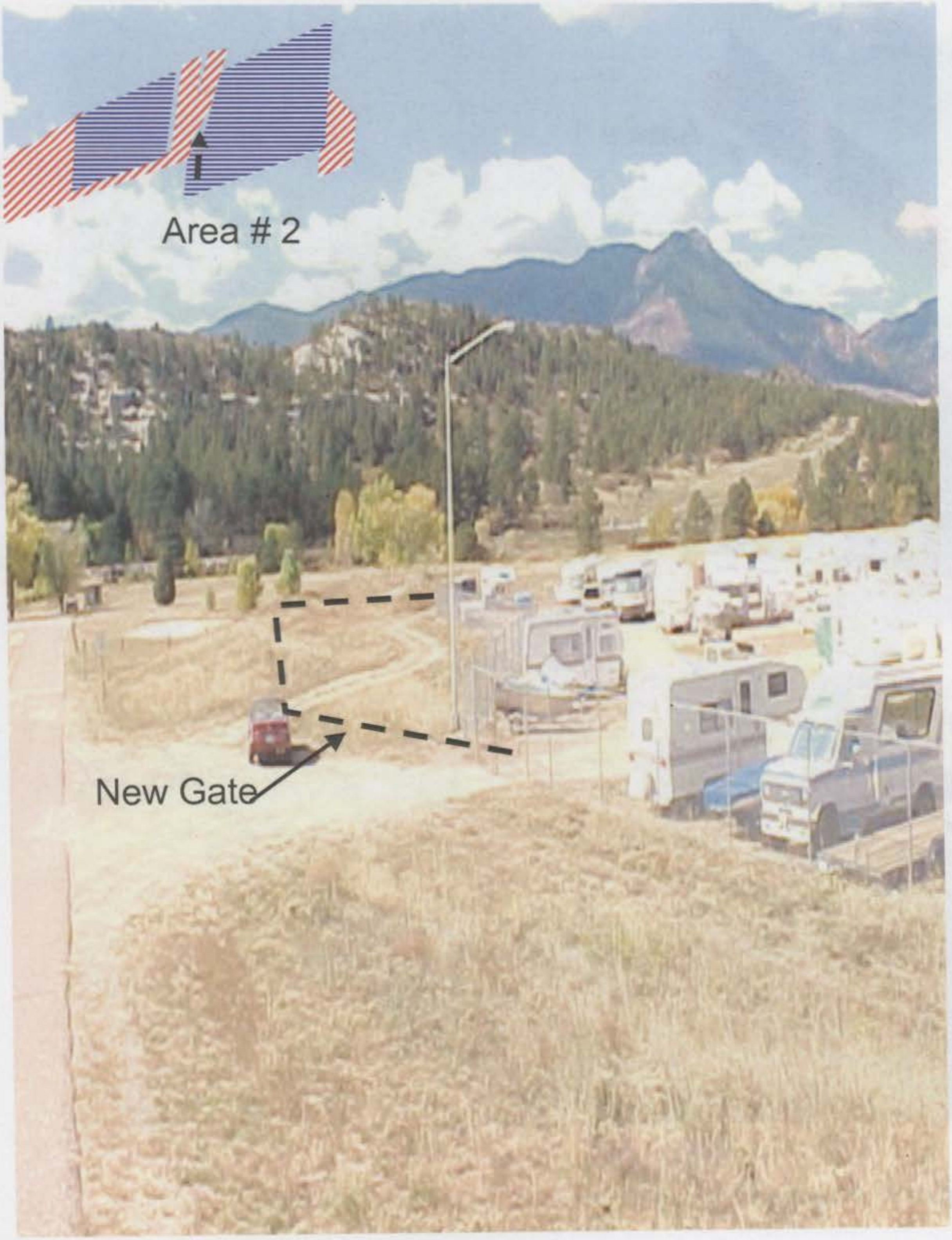

Figure 4: Proposed Expansion Area No. 2 Looking West

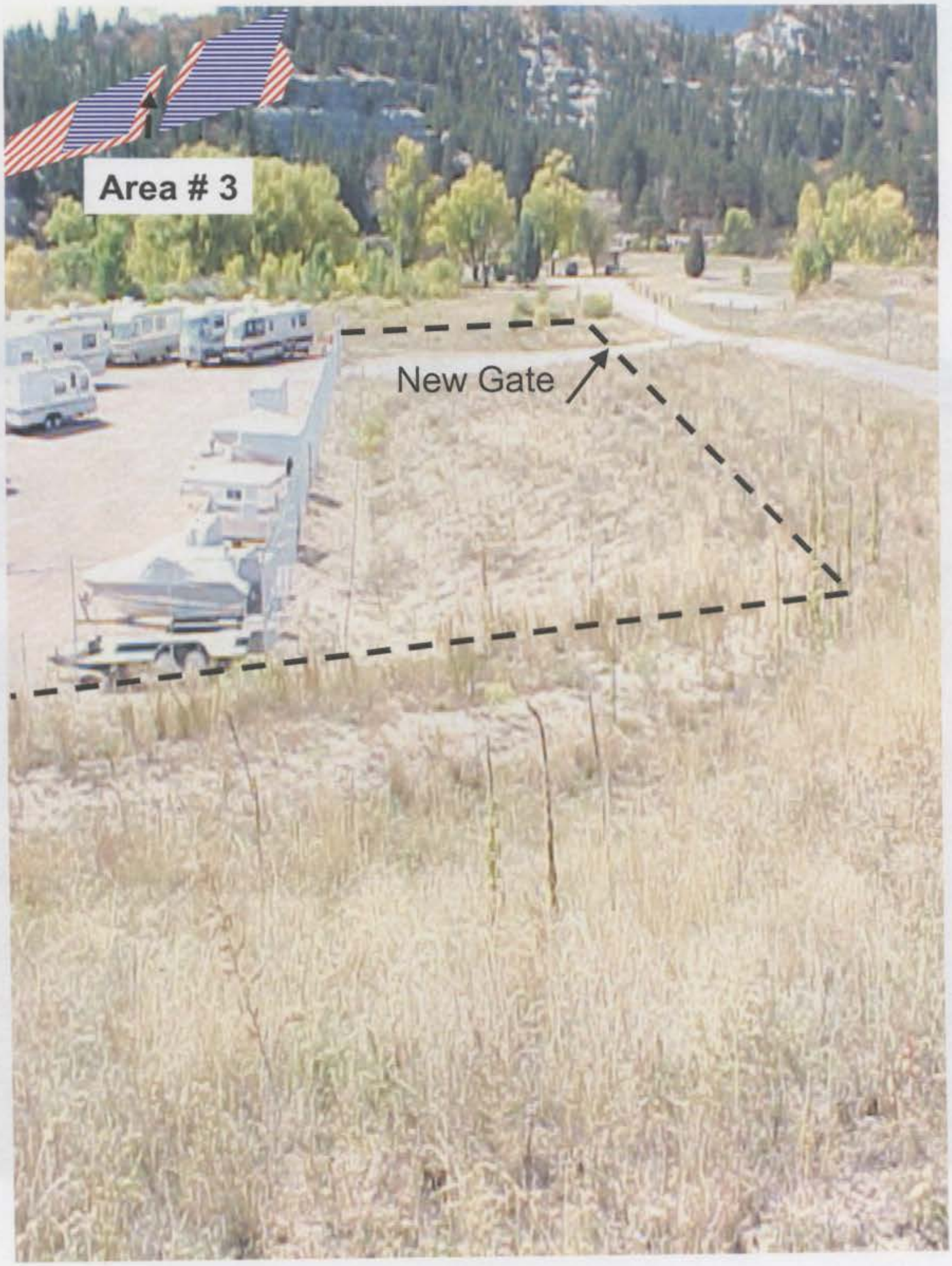

Figure 5: Proposed Expansion Area No. 3 Looking West

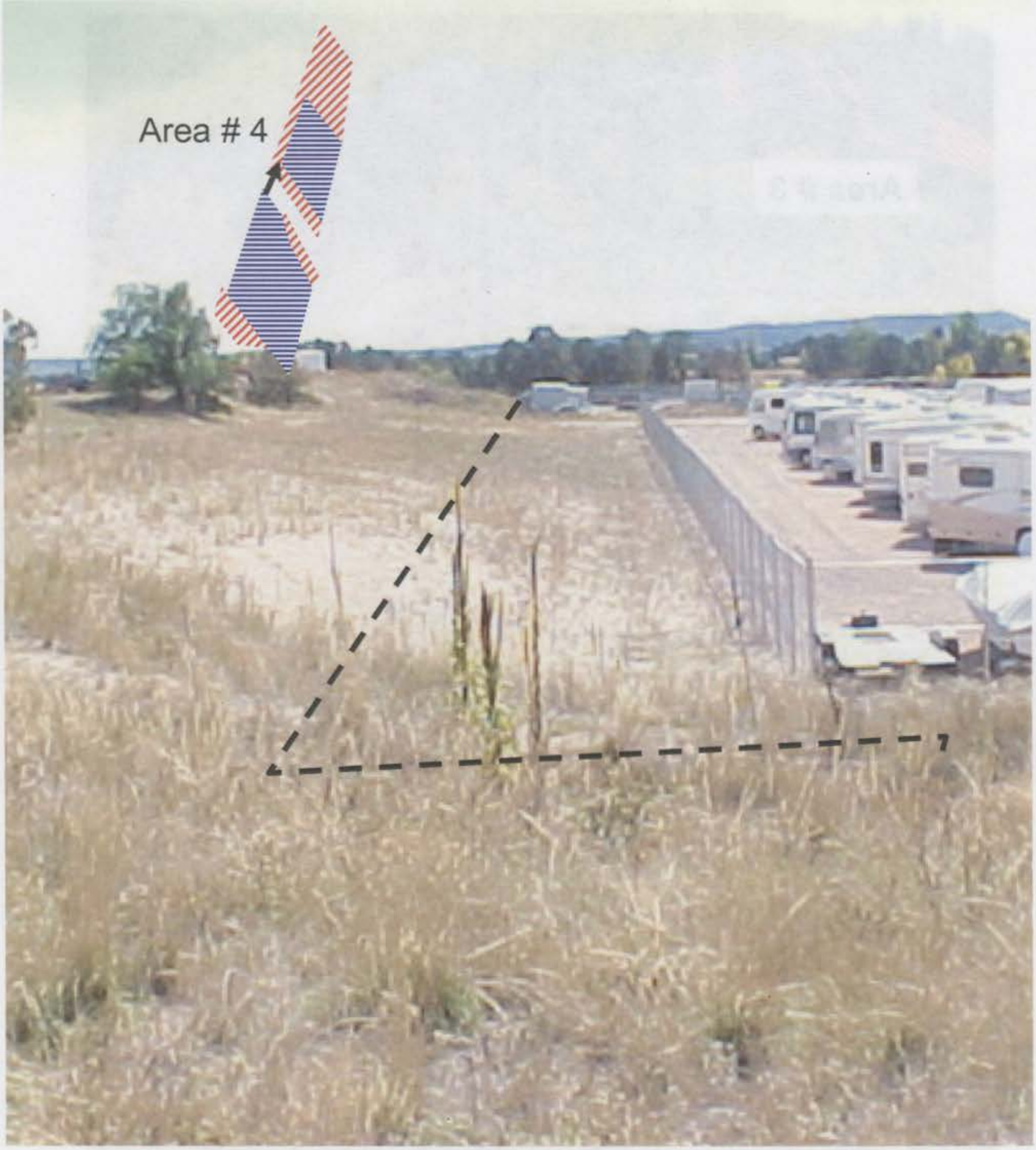

Figure 6: Proposed Expansion Area No. 4 Looking South

Figure 7: Proposed Expansion Areas Nos. 5 and 6 Looking West

Storm water control structures would be installed to maintain storm water runoff at historic rates for the southern part of the proposed RV Storage Lot. A storm water detention pond currently controls runoff from the northern part of the existing lot. Construction of the detention pond was completed in 2000, and it was constructed to retain and infiltrate storm flows below the 10-year frequency and maintain release rates for 10- to 100-year storm frequencies at the 10-year storm release rate. Proposed expansion at the northern part of the existing lot would not increase the drainage area flowing to the existing pond.

A preliminary runoff screening analysis for the southern part of the proposed lot shows developed storm water flows would exceed undeveloped flows. Table 2.1-1 summarizes differences in runoff flow rates and flow volumes between developed and undeveloped conditions. NEPA requires comparison between undeveloped and developed conditions to evaluate cumulative effects. The Academy's MS4 Permit requires post-construction storm water controls for projects exceeding one acre.

Table 2.1-1: Storm Water Flow Comparison

Storm event	Rainfall (inches)	Undeveloped Flow Rate (cubic feet per second)	Undeveloped Runoff Volume (acre-feet)	Developed Flow Rates (cubic feet per second)	Developed Runoff Volume (acre-feet)	Difference between Developed and Undeveloped Runoff Volumes (acre-feet)
2-year 24-hour	2.00	0.00	0.000	4.03	0.213	0.213
5-year 24-hour	2.60	0.02	0.013	7.85	0.390	0.377
10-year 24-hour	3.00	0.05	0.038	10.70	0.523	0.485
25-year 24-hour	3.40	0.17	0.077	13.71	0.667	0.590
50-year 24-hour	3.80	0.55	0.126	16.87	0.818	0.692
100-year 24-hour	4.20	1.23	0.185	20.12	0.976	0.791

The screening analysis was conducted using Natural Resource Conservation Service Method TR-55 through a commercial software program called HydroCAD™. Hydrographs, summary data, and input parameter assumptions are shown in Appendix C. Method TR-55 does not produce results as reliable as the Rational Method for storm water runoff analysis when analyzing small watersheds. Runoff calculations using the Rational Method are shown in Table 2.1-2 below.

Table 2.1-2: Storm Water Flow Rates using Rational Method

Rational Method: Q=CiA, where C= runoff coefficient, i= rainfall intensity, A = area of runoff
Procedure taken from Colorado Springs Drainage Criteria Manual, Volume I

Developed runoff	Runoff in cubic feet per second	Tc for developed (Minutes_	Tc for undeveloped (Minutes)	Undeveloped runoff	Runoff in cubic feet per second	Difference in peak runoff
2-year storm event	6.25	26.78	37.94	2-year storm event	2.34	3.91
5-year storm event	7.81	26.78	37.94	5-year storm event	3.13	4.69
10-year storm event	9.69	26.78	37.94	10-year storm event	3.75	5.94
25-year storm event	15.00	22.31	33.47	25-year storm event	7.22	7.78
50-year storm event	16.13	22.31	33.47	50-year storm event	8.53	7.59
100-year storm event	20.63	22.31	33.47	100-year storm event	8.86	11.77

$Tc_{10} = [1.87(1.1\text{-}C_{10})L^{.05}]/S^{0.33}$

Where Tc_{10} = overland travel time for a 10-year storm event

C_{10} = runoff coefficient for a 10-year storm

L = length of flow

S = slope (assume 2% slope)

Both methods of runoff analysis show that developed runoff flow rates will increase over historical undeveloped flow rates. One of the following storm water best management practices (BMP) would be installed to control runoff from the southern portion of the proposed RV Storage Lot for storm water events shown in Tables 2.1-1 and 2.1-2. These structures are described in detail in Section 4.0 of the Colorado Springs Drainage Criteria Manual, Volume II. The entire manual can be downloaded at the following webpage address: http://www.springsgov.com/Page.asp?NavID=2644. Descriptions of the following structures are reprinted from the manual:

Grass Swale

A grass swale (GS) sedimentation facility is an integral part of the "minimizing directly connected impervious areas" MDCIA development concept. They are densely vegetated drainageways with low-pitched sideslopes that collect and slowly convey runoff. Design of their longitudinal slope and cross-section size forces the flow to be slow and shallow, thereby facilitating sedimentation while limiting erosion. Berms or check dams should be installed perpendicular to the flow as needed to slow it down and to encourage settling and infiltration.

General Application

A GS can be located to collect overland flows from areas such as parking lots, buildings, residential yards, roadways and grass buffer strips (GBs). They can be made a part of the plans to minimize a directly connected impervious area by using them as an alternative to a curb-and gutter system. A GS is set below adjacent ground level, and runoff enters the swales over grassy banks. The potential exists for wetland vegetation to become established if the swale experiences standing water or if there is a base flow. If that condition is possible, consider the use of underdrains. A site with a base flow should be managed as either a swale with an unlined trickle channel, or as a wetland bottom channel, the latter providing an additional BMP to stormwater runoff.

Advantages/Disadvantages
General

A GS, which can be more aesthetically pleasing than concrete or rock-lined drainage systems, is generally less expensive to construct. Although limited by the infiltration capacity of local soils, this BMP can also provide some reduction in runoff volumes from small storms. Dense grasses can reduce flow velocities and protect against erosion during larger storm events. Swales in residential and commercial/industrial settings can also be used to limit the extent of directly connected impervious areas.

The disadvantages of using GSs without underdrains include the possibility of soggy and wet areas in front yards, the potential for mosquito breeding areas, and the potential need for more right-of-way than is needed for a storm sewer.

Physical Site Suitability

A GS is practical only at sites with general ground slopes of less than 4 percent and are definitely not practical for sites steeper than 6 percent. The longitudinal slopes of a GS should be kept to less than 1 percent, which often necessitates the use of grade control checks or drop structures. Where the general terrain slope exceeds 4 percent, a GS is often practical only on the upslope side of the adjacent street. When soils with high permeability (for example, Class A or B) are available, the swale will infiltrate a portion of the runoff into the ground, but such soils are not required for effective application of this BMP. When Class C and D soils are present, the use of a sand/gravel underdrain is recommended.

Pollutant Removal

Removal rates reported in literature vary and fall into the low to medium range. Under good soil conditions and low flow velocities, moderate removal of suspended solids and associated other constituents can be expected. If soil conditions permit, infiltration can remove low to moderate loads of soluble pollutants when flow velocities are very low. As a result, small frequently occurring storms can benefit the most. See Table ND-2 in section 4.1, *New Development Planning* for estimated ranges in pollutant removal rates by this BMP.

Extended Detention Basin

An extended detention basin (EDB) is a sedimentation basin designed to totally drain dry sometime after stormwater runoff ends. It is an adaptation of a detention basin used for flood control. The primary difference is in the outlet design. The EDB uses a much smaller outlet that extends the emptying time of the more frequently occurring runoff events to facilitate pollutant removal. The EDB's drain time for the brim-full water quality capture volume (i.e., time to fully evacuate the design capture volume) of 40 hours is recommended to remove a significant portion of fine particulate pollutants found in urban stormwater runoff. Soluble pollutant removal can be somewhat enhanced by providing a small wetland marsh or ponding area in the basin's bottom to promote biological uptake. The basins are considered to be "dry" because they are designed not to have a significant permanent pool of water remaining between storm runoff events. However, EDB may develop wetland vegetation and sometimes shallow pools in the bottom portions of the facilities.

General Application

An EDB can be used to enhance stormwater runoff quality and reduce peak stormwater runoff rates. If these basins are constructed early in the development cycle, they can also be used to trap sediment from construction activities within the tributary drainage area. The accumulated sediment, however, will need to be removed after upstream land disturbances cease and before the basin is placed into final long-term use. Also, an EDB can sometimes be retrofitted into existing flood control detention basins. EDBs can be used to improve the quality of urban runoff from roads, parking lots, residential neighborhoods, commercial areas, and industrial sites and are generally

used for regional or follow-up treatment. They can also be used as an onsite BMP and work well in conjunction with other BMPs, such as upstream onsite source controls and downstream infiltration/filtration basins or wetland channels. If desired, a flood routing detention volume can be provided above the water quality capture volume (WQCV) of the basin.

Advantages/Disadvantages
General

An EDB can be designed to provide other benefits such as recreation and open space opportunities in addition to reducing peak runoff rates and improving water quality. They are effective in removing particulate matter and the associated heavy metals and other pollutants. As with other BMPs, safety issues need to be addressed through proper design.

Physical Site Suitability

Normally, the land required for an EDB is approximately 0.5 to 2.0 percent of the total tributary development area. In high groundwater areas, consider the use of retention ponds (RP) instead in order to avoid many of the problems that can occur when the EDB's bottom is located below the seasonal high water table. Soil maps should be consulted, and soil borings may be needed to establish design geotechnical parameters.

Pollutant Removal

The pollutant removal range of an EDB was presented in section 4.1, Table ND-2. Removal of suspended solids and metals can be moderate to high, and removal of nutrients is low to moderate. The removal of nutrients can be improved when a small shallow pool or wetland is included as part of the basin's bottom or the basin is followed by BMPs more efficient at removing soluble pollutants, such as a filtration system, constructed wetlands or wetland channels. The major factor controlling the degree of pollutant removal is the emptying time provided by the outlet. The rate and degree of removal will also depend on influent particle sizes. Metals, oil and grease, and some nutrients have a close affinity for suspended sediment and will be removed partially through sedimentation.

Aesthetics and Multiple Uses

Since an EDB is designed to drain very slowly, its bottom and lower portions will be inundated frequently for extended periods of time. Grasses in this frequently inundated zone will tend to die off, with only the species that can survive the specific environment at each site eventually prevailing. In addition, the bottom will be the depository of all the sediment that settles out in the basin. As a result, the bottom can be muddy and may have an undesirable appearance to some. To reduce this problem and to improve the basin's availability for other uses (such as open space, habitat or passive recreation), it is suggested that the designer provide a lowerstage basin as suggested in the Two

Stage Design procedure. As an alternative, a retention pond (RP) could be used, in which the settling occurs primarily within the permanent pool.

Sand Filter Extended Detention Basin

A sand filter extended detention basin (SFB) is a stormwater filter that consists of a runoff storage zone underlain by a sand bed with an underdrain system. During a storm, accumulated runoff ponds in the surcharge zone and gradually infiltrates into the underlying sand bed, filling the void spaces of the sand. The underdrain gradually dewaters the sand bed and discharges the runoff to a nearby channel, swale, or storm sewer.

General Application

A SFB is generally suited to offline, onsite configurations where there is no baseflow and the sediment load is relatively low.

Advantages/Disadvantages
General

Primary advantages of SFBs include effective water quality enhancement through settling and filtering. The primary disadvantage is a potential for clogging if a moderate to high level of silts and clays are allowed to flow into the facility. Such clogging would result in the need for significant maintenance. For this reason, it should **not** be put into operation while construction activities are taking place in the tributary catchment. Also, this BMP should not be located close to building foundations or other areas where expansive soils are a concern, although an underdrain and impermeable liner can ameliorate some of this concern.

Physical Site Suitability

Since an underdrain system is incorporated into this BMP, SFB is suited for about any site; presence of sandy subsoils is not a requirement. This BMP has a relatively flat surface area, so it may be more challenging to incorporate it into steeply sloping terrain.

Pollutant Removal

Although not fully tested to date in the Denver area, the tests on filter vaults in the Denver area and other parts of United States show that the amount of pollutant removed by this BMP should be significant and should at least equal the removal rates by sand filters tested elsewhere. See Table ND-2 for estimated ranges in pollutant removals.

Maintenance Needs

Before selecting this BMP, be sure that the maintenance specified in the Maintenance Requirements chapter of this manual will be provided by either a local government or by the owner. This BMP's performance is critical on having regular maintenance provided.

Constructed Wetlands Basin

A constructed wetlands basin (CWB) is a shallow retention pond (RP) which requires a perennial base flow to permit the growth of rushes, willows, cattails, and reeds to slow down runoff and allow time for sedimentation, filtering, and biological uptake. It is a sedimentation basin and a form of a treatment plant. A CWB differ from "natural" wetlands as they are totally human artifacts that are built to enhance stormwater quality. Sometimes small wetlands that exist along ephemeral drainage ways on Colorado's high plains could be enlarged and incorporated into the constructed wetland system. Such action, however, requires the approval of federal and state regulators. Current regulations intended to protect natural wetlands recognize a separate classification of wetlands constructed for a water quality treatment. Such wetlands generally are not allowed on receiving waters and cannot be used to mitigate the loss of natural wetlands but are allowed to be disturbed by maintenance activities. Therefore, the legal and regulatory status of maintaining a wetland constructed for the primary purpose of water quality treatment, such as the CWB, is separate from the disturbance of a natural wetland. Nevertheless, the U.S. Army Corps of Engineers has established maximum areas that can be maintained under a nationwide permit. Thus, any activity that disturbs a constructed wetland should be first cleared through the U.S. Army Corps of Engineers to ensure it is covered by some form of an individual, general, or nationwide 404 permit.

General Application

A CWB can be used as a follow-up structural BMP in a watershed, or as a stand-alone onsite facility if the owner provides sufficient water to sustain the wetland. Flood control storage can be provided above the CWB's water quality capture volume (WQCV) pool to act as a multiuse facility. CWB requires a net influx of water to maintain its vegetation and microorganisms. A complete water budget analysis is necessary to ensure the adequacy of the base flow.

Advantages/Disadvantages
General

A CWB offers several potential advantages, such as natural aesthetic qualities, wildlife habitat, erosion control, and pollutant removal. It can also provide an effective follow-up treatment to onsite and source control BMPs that rely upon settling of larger sediment particles. In other words, it offers yet another effective structural BMP for larger tributary catchments. The primary drawback of the CWB is the need for a continuous base flow to ensure viable wetland growth. In addition, silt and scum can accumulate and unless properly designed and built, can be flushed out during larger storms. In addition, in order to maintain a healthy wetland growth, the surcharge depth for WQCV above the permanent water surface cannot exceed 2 feet. Along with routine good housekeeping maintenance, occasional "mucking out" will be required when sediment accumulations become too large and affect performance. Periodic sediment removal is also needed for proper distribution of growth zones and of water movement within the wetland.

Physical Site Suitability

A perennial base flow is needed to sustain a wetland, and should be determined using a water budget analysis. Loamy soils are needed in a wetland bottom to permit plants to take root. Exfiltration through a wetland bottom cannot be relied upon because the bottom is either covered by soils of low permeability or because the groundwater is higher than the wetland's bottom. Also, wetland basins require a near-zero longitudinal slope, which can be provided using embankments.

Pollutant Removal

See Table ND-2 for estimated ranges in pollutant removals. Reported removal efficiencies of constructed wetlands vary significantly. Primary variables influencing removal efficiencies include design, influent concentrations, hydrology, soils, climate, and maintenance. With periodic sediment removal and routine maintenance, removal efficiencies for sediments, organic matter, and metals can be moderate to high; for phosphorous, low to high; and for nitrogen, zero to moderate. Pollutants are removed primarily through sedimentation and entrapment, with some of the removal occurring through biological uptake by vegetation and microorganisms. Without a continuous dry-weather base flow, salts, and algae can concentrate in the water column and can be released into the receiving water in higher levels at the beginning of a storm event as they are washed out. Researchers still do not agree whether routine aquatic plant harvesting affects pollutant removals significantly. Until research demonstrates and quantifies these effects, periodic harvesting for the general upkeep of wetland, and not routine harvesting of aquatic plants, is recommended.

To maintain compliance with the MS4 Permit, after one of the structural controls described above is selected, design documents would include:

- A description of the structural and non-structural BMPs that would be used to manage post-construction runoff from the project An explanation of the design features of the chosen BMPs that are intended to minimize water quality impacts

- A description of how long-term operation and maintenance of the selected BMPs will be performed.

Construction of the proposed expansion would be conducted in compliance with the Academy's Construction Permits. The Construction Permit, which is enforceable by the US Environmental Protection Agency, requires control of runoff during construction until the site is permanently stabilized and requires the construction contractor to prepare a storm water pollution prevention plan (SWPPP) that meets the following requirements:

A. The SWPPP would identify all operators for the project site, and the areas of the site over which each operator has control.

B. The SWPPP would describe the nature of the construction activity, including:

1. The function of the project;

2. The intended sequence and timing of activities that disturb soils at the site;

3. Estimates of the total area expected to be disturbed by excavation, grading, or other construction activities, including dedicated off-site borrow and fill areas; and

4. A general location map (e.g., USGS quadrangle map, a portion of a city or county map, or other map) with enough detail to identify the location of the construction site and waters of the United States within one mile of the site.

C. The SWPPP would contain a legible site map, showing the entire site, identifying:

1. Direction(s) of storm water flow and approximate slopes anticipated after major grading activities;

2. Areas of soil disturbance and areas that will not be disturbed;

3. Locations of major structural and nonstructural BMPs identified in the SWPPP;

4. Locations where stabilization practices are expected to occur;

5. Locations of off-site material, waste, borrow or equipment storage areas;

6. Locations of all waters of the United States (including wetlands);

7. Locations where storm water discharges to a surface water; and

8. Areas where final stabilization has been accomplished and no further construction-phase permit requirements apply.

D. The SWPPP would describe and identify the location and description of any storm water discharge associated with industrial activity other than construction at the site.

E. The SWPPP would include a description of all pollution control measures, such as silt fencing, that will be implemented as part of the construction activity to control pollutants in storm water discharges. For each major activity identified in the project description the SWPPP would clearly describe appropriate control measures, the general sequence during the construction process in which the measures will be implemented, and which the operator is responsible for the control measure's implementation.

F. The SWPPP would include a description of interim and permanent stabilization practices for the site, including a schedule of when the practices will be implemented. Site plans would ensure that existing vegetation is preserved where possible and that

disturbed portions of the site are stabilized. Use of impervious surfaces for stabilization would be avoided.

G. The following records would be maintained as part of the SWPPP:

1. Dates when major grading activities occur;

2. Dates when construction activities temporarily or permanently cease on a portion of the site; and

3. Dates when stabilization measures are initiated.

H. The SWPPP would include a description of structural practices to divert flows from exposed soils, retain/detain flows or otherwise limit runoff and the discharge of pollutants from exposed areas of the site.

I. The SWPPP would include a description of all post-construction storm water management measures that will be installed during the construction process to control pollutants in storm water discharges after construction operations have been completed. Structural measures would be placed on upland soils to the degree practicable. Such measures would be designed and installed in compliance with applicable federal, local, state or tribal requirements.

J. The SWPPP would describe measures to prevent the discharge of solid materials, including building materials, to waters of the United States, except as authorized by a permit issued under section 404 of the CWA.

K. The SWPPP would describe measures to minimize, to the extent practicable, off-site vehicle tracking of sediments onto paved surfaces and the generation of dust.

L. The SWPPP would include a description of construction and waste materials expected to be stored on-site with updates as appropriate. The SWPPP would also include a description of controls, including storage practices, to minimize exposure of the materials to storm water, and spill prevention and response practices.

M. All erosion and sediment control measures and other protective measures identified in the SWPPP would be maintained in effective operating condition. If site inspections required by Subpart 3.10 of the Construction Permit identify best management practices (BMPs) that are not operating effectively, maintenance would be performed as soon as possible and before the next storm event whenever practicable to maintain the continued effectiveness of storm water controls.

N. If existing BMPs need to be modified or if additional BMPs are necessary for any reason, implementation would be completed before the next storm event whenever practicable. If implementation before the next storm event would be impracticable, the situation would be documented in the SWPPP and alternative BMPs would be implemented as soon as possible.

2.2 No Action Alternative

The No Action Alternative would leave the existing site unchanged. A waiting list would continue to exist, and the needs of the RV Storage Lot customers would not be met. Environmental conditions would remain the same as described in Section 3.0.

2.3 Identification of Alternatives Eliminated from Further Consideration

Alternative 2 would construct an additional 275 RV parking spaces next to the existing lot. This alternative would expand the lot into PMJM habitat. This alternative was eliminated from further consideration because it would encroach into PMJM habitat.

Alternative 3 would construct an additional 275 RV parking spaces at the northern end of the Academy along the current contractor staging road. This alternative was eliminated from further consideration because RV parking would not be a compatible land use with this area. Construction in this area would also disturb more previously-undisturbed area than the Proposed Action.

Alternative 4 would construct additional RV parking spaces next to the Auto Hobby Shop. This alternative was eliminated because space outside PMJM habitat was limited, and visual effects from this alternative would violate the Academy's Master Plan and National Historic Preservation Act requirements.

Alternative 5 is similar to the No Action Alternative in that it would not require additional construction on the Academy. This alternative was evaluated in the needs assessment and would involve a public-private agreement whereby a private entity would provide RV parking space off site at rates equivalent to what the Academy charges. This alternative was rejected because the rate of investment payback was inadequate to attract private investors. See the needs assessment in Appendix A for additional information regarding this alternative.

2.4 Identification of the Preferred Alternative

The Academy's preferred alternative is the Proposed Action.

2.5 Comparison of Environmental Impacts of Alternatives Examined in Detail

Table 2.5-1 Comparison of Environmental Consequences

Environmental Resource Areas	Proposed Action	No Action Alternative
Air Quality	Short-term – Minor Adverse Long-term – No Impacts	Short-term – No Impacts Long-term – No Impacts
Air Space	Short-term – No impacts Long-term – No impacts	Short-term – No Impacts Long-term – No Impacts
Noise	Short-term – Minor Adverse Long-term – No Impacts	Short-term – No Impacts Long-term – No Impacts
Biological Resources	Short-term – No Impacts Long-term – No Impacts	Short-term – No Impacts Long-term – No Impacts
Wastes, Hazardous Materials, Stored Fuel	Short-term – Minor Adverse Long-term – Minor Adverse	Short-term – No Impacts Long-term – No Impacts
Water Resources	Short-term – Minor Adverse Long-term – Minor Beneficial	Short-term – No Impacts Long-term – No Impacts
Geology and Soils	Short-term – No Impacts Long-term – Beneficial	Short-term – No Impacts Long-term – No Impacts
Cultural Resources	Short-term – No Impacts Long-term – No Impacts	Short-term – No Impacts Long-term – No Impacts
Land Use	Short-term – No Impacts Long-term – No Impacts	Short-term – No Impacts Long-term – No Impacts
Environmental Justice	Short-term – No Impacts Long-term – No Impacts	Short-term – No Impacts Long-term – No Impacts
Indirect and Cumulative Impacts	Short-term – Minor Beneficial Long-term – Minor Beneficial	Short-term – No Impacts Long-term – No Impacts

SECTION 3.0
AFFECTED ENVIRONMENT

3.1 Physical and Demographic Setting

The Academy is located six miles north of Colorado Springs and 60 miles south of Denver and includes about 18,500 contiguous acres used for accomplishing its mission. The Academy also owns the Farish Memorial Recreational Annex, which is located northeast of Woodland Park and includes 650 acres used as a recreational area. The Rampart Range lies along the western border of the Academy, and prairie lands lie to the east. The geographic position of the Academy places it at the junction of two important physiographic and ecological zones, the montane and alpine ecosystems at higher elevations and prairie and grassland ecosystems at lower elevations. The Palmer Divide located six miles north of the Academy separates drainage basins of the Platte and the Arkansas Rivers. Because the Academy lies within the transition area from one zone to another, many species of plants and animals reach their range limits in this general region.

The proposed project would be located in the Base Service and Supply Area within an area designated for industrial use (GRW, 2000). This area provides warehousing facilities, equipment storage, and administrative support for the entire installation. Descriptions of soil and water resources in the proposed project area are shown in Section 4.0.

The daily Academy population is about 16,000 people, which consists of military, civilian, and long-term contractor employees, as well as, the Cadet population. Additional short-term contractors and visitors could add another 10,000 people to the daily population. Special events, such as football games, could add up to 50,000 people for several hours on several occasions throughout the year. Off-site population demographics are shown in Appendix B.

3.2 Environmental Setting

3.2.1 Meteorology

The location of the Academy at the base of the Front Range and the High Plains produces dynamic weather conditions throughout the year. The regional climate is semiarid. Mean monthly temperatures vary from the low thirties during the winter to high sixties during the summer. Extremes of temperature range from -21°F to 100°F [Weather Data Services Division (WDSD), 2004].

The Academy receives about 16 inches of precipitation per year. Most precipitation comes as rain during thunderstorms from late spring to early fall (April-September). The maximum annual precipitation recorded for the Academy proper is 22.9 inches; the

minimum is 8.0 inches. The maximum rainfall recorded at the airfield was 4.1 inches within a single 24-hour period. Between 1967 and 2004, measurable amounts of snow have been recorded throughout the year except for the months of July and August (WDSD, 2004).

Snow cover rarely persists for long periods of time during the winter. A combination of moderate daytime temperatures and low humidity causes snow to melt or sublimate quickly. Sublimation is similar to evaporation except that it involves solids rather than liquids.

Prevailing wind direction is from the north and average wind speed is 9 miles per hour (mph). However, winds gusts in excess of 50 mph have been recorded during every month since 1967. Both the strongest mean wind speeds (11 mph) and the strongest wind gusts (73 mph) have been recorded during the months of December through April (WDSD, 2004).

3.2.2 Air Quality

The Academy lies within the Colorado Springs Urbanized Area. From the Pikes Peak Area Council of Governments (PPACG) **Air Quality in the Pikes Peak Region, Monitoring and Trends Report, October 2003:**

"This Report gives an overview of the spatial and temporal trends in the Pikes Peak Region for the six air quality pollutants the Environmental Protection Agency (EPA) is required to monitor: carbon monoxide (CO), ozone (O3), sulfur dioxide (SO2), nitrogen dioxide (NO2), lead (Pb) and particulate matter (PM2.5 and PM10). The source and health effects of each pollutant are described and graphs both identify the pollutant levels from data available since 1988 and also compare them to the State and Federal ambient air quality standards. Mitigation strategies for each pollutant are also included. The Colorado Springs Urbanized Area (Figure 1) is currently in attainment (meeting air quality standards) for all of the six air quality pollutants. The last violations in our region were in 1988 for carbon monoxide and in 1983 for ozone. Although our region is currently meeting air quality standards, this report will show that based upon current trends, certain air quality pollutants could exceed the standards in the future. Each year an addendum will be developed for this report that will include all air quality data available from the previous year and analysis of any changes in spatial and temporal trends. Changes to State and Federal laws that affect air quality in the region will also be included."

From the PPACG report, **2004 Air Quality Data Addendum, Air Quality in the Pikes Peak Region Spatial and Temporal Trends:**

"The 2004 Air Quality Data Addendum provides an analysis of air quality trends for Carbon Monoxide, Sulfur Dioxide, Nitrogen Dioxide, Lead and Particulate Matter

through 2003 and for ozone through 2004 based on air quality data available for the Pikes Peak Region. This is the first addendum to the Air Quality Trends Report that was
completed in October 2003 and provided an analysis of air quality trends through 2002. This addendum indicates no change in temporal trends."

Potential air quality effects resulting from the proposed project will be described in Section 4.0.

3.2.2 Noise

Intermittent heavy equipment, truck, and bus noise exists within the Base Service and Supply Area. Minor noise results from passenger cars and pickups operated by personnel that work in the area, vendors, and patrons of the existing RV Storage Lot. No complaints have been received regarding noise levels in this area.

3.2.3 Hazardous Materials, Hazardous Waste, and Fuels Management

The Academy operates several shops in the Base Service and Supply Area that use relatively small quantities of hazardous materials (less than 10 gallons). Management of these materials is controlled through regular safety inspections, annual audits, and compliance with the Hazardous Materials Management Program (HMMP). The HMMP requires all hazardous materials users to receive authorization from the HMMP team before purchasing. Hazardous materials containers are bar coded and tracked to ensure proper management.

The Academy operates a hazardous waste accumulation site in this area. Waste paint, solvents, fluorescent light bulbs, and used oil make up most of the waste managed at the site. The Academy is regulated as a small quantity generator of hazardous waste by the Colorado Department of Public Health and Environment. The hazardous waste accumulation site is designed to prevent spills and releases through extensive use of spill containment devices and operation by highly trained individuals.

Two underground storage tanks containing gasoline and diesel fuel are located in the Base Service and Supply Area. The tanks are in compliance with federal and state underground storage tank locations and are equipped with leak detection equipment. One 500-gallon aboveground diesel tank serves an emergency generator located at the sewer lift station north of the existing RV Storage Lot. No fuels or other hazardous materials are stored in the RV Storage Lot. Some of the RVs would contain fuels or hazardous materials; however, vehicles are not considered storage tanks or containers.

3.2.4 Water Resources

The proposed project area lies on the east side of Monument Creek outside the 100-year floodplain. Monument Creek generally flows from north to south in this area. Kettle Creek flows into Monument Creek from the east about 800 to 1,000 feet south of the southernmost boundary of the proposed southern RV Parking Lot expansion. An

existing detention pond that overflows into Monument Creek collects storm water runoff from the section of the RV Storage Lot north of Park Drive. The detention pond was constructed in 2000 and was designed to handle runoff from much of the Base Service and Supply Area.

The southern portion of the existing lot drains by way of sheet flow toward Monument Creek. Sheet flow tends to become channelized outside the northwestern corner of the southern portion of the existing RV Storage Lot. The CE storage yard adjacent to and south of the current vehicle impound lot drains southwest toward Kettle Creek. The proposed project would maintain the current surface-water-flow direction at the southern portion of the RV Storage Lot.

No groundwater wells used for drinking water are known to exist in the area. Groundwater monitoring wells connected with Restoration Site 11 showed groundwater depth ranges from a depth of 5 to 30 feet below ground surface (URS 2001). Shallow, unconfined groundwater at Site 11 is typically encountered at depths of about 6 to 40 feet below ground surface (URS 2002). Site 11 is a closed restoration site that included the area surrounding the RV Storage Lot. The restoration site and monitoring wells were officially closed under oversight from the Colorado Department of Public Health and Environment because no further cleanup action was deemed necessary (URS 2002).

3.2.5 Biological Resources

3.2.5.1 Vegetative Communities

The proposed project area is mostly covered by gravel parking lots; however, some native grass species exist along the borders of existing fences. Native vegetation is mainly western wheatgrass, sideoats grama, needle and thread, and little bluestem. No known endangered or threatened plant species or plant species or plant communities of special concern occur within the project area.

3.2.5.2 Wetlands

A small wetlands exists at the eastern end of the existing storm water detention pond that serves the northern portion of the existing RV Parking Lot. The wetlands were created by storm water flowing from roads and parking lots in the Base Service and Supply Area. The wetlands have not been officially designated as such by the US Army Corps of Engineers.

3.2.5.3 Wildlife

No threatened or endangered animal species or animal communities of special concern exist within the project area (Integrated Natural Resource Management Plan 2003). PMJM habitat is located near the project area; however, the project lies outside the designated habitat boundaries.

3.2.6 Geology and Soils

Soil surveys conducted between 1961 and 1974 by United States Department of Agriculture indicate that this area is dominated by a Columbine gravelly sandy loam. This soil type is deep, well to excessively well drained, formed in coarse textured material on alluvial terraces and fans and on flood plains. Typically, the surface layer is grayish brown gravelly sandy loam about 14 inches thick. The underlying material is light yellowish brown gravelly loamy sand.

Included with this soil in mapping are small areas of Stapleton sandy loam, 3 to 8 percent slopes; Blendon Sandy loam, 0 to 3 percent slopes; Louviers silty clay loam, 3 to 18 percent slopes; Fluvaquentic Haplaquolls, nearly level. In places the parent arkose beds of sandstone or shale are at a depth of 0 to 40 inches. Permeability of this Columbine soil is very rapid. Effective rooting depth is 60 inches or more. Available water capacity is low to moderate. Surface runoff is slow and the hazard of erosion is slight to moderate (USDA 1981).

From the Site 11 Final No Further Action Decision Document (URS 2002), "The surficial material at Site 11 consists of unconsolidated Quaternary Alluvium made up of sand, gravel, and clay ranging in thickness from 10 to 45 feet (USGS 1995). The Quaternary deposits are generally unsaturated in the north half of the site. In the southern half of the site, the lower portion of the Quaternary deposits is saturated. The bedrock beneath the alluvial deposits is reportedly weathered Arapahoe Formation, consisting of interbedded sandstone and claystone, often weathered (USGS 1995.)"

3.2.7 Cultural Resources

Cultural resource issues include historically significant structures contributing to the status of the Academy as a National Historic site and archaeological and paleontological sites. Actions must be evaluated for potential effects on the historic status of the Academy and coordinated with the State Historic Preservation Office. The Cadet Area is a National Historic Landmark. The rest of the Academy is eligible to be designated a historic district. The proposed project area is not located within the National Historic Landmark area.

3.2.7.1 Historic Resources

No known historic resources exist within the project areas. The proposed project would expand current fence lines without constructing any new buildings. Actions at the RV Storage Lot would not affect views to and from the Cadet Area. Consultation with the

State Historic Preservation Office is completed and concurrence that this project would have no adverse effect on historic resources has been obtained. However, the concurrence is based on the assumption that the Academy would plant trees or other vegetation to block the view of the RV lot from the east.

3.2.7.2 Archaeology/Paleontology

No known archaeological or paleontological resources exist in the project area or construction staging areas for the project. If such discoveries occurred, the Cultural Resources Manager would be contacted, and emergency response procedures outlined in the Integrated Cultural Resources Management Plan would be followed.

4.0 Environmental Consequences

The following sections describe the environmental impacts of the Proposed Action and No Action alternative on the natural environment. Air quality, geology, water resources, hazardous materials and wastes, biological resources, and cultural resources are discussed in this section.

4.1 Air Quality

4.1.1 Proposed Action

Operation of construction equipment (loaders, graders, trucks, etc.) would cause dust emissions during grading and leveling of the RV Parking Lot if control measures, such as watering, were not implemented. However, compliance with the El Paso County Construction Permit requires site watering or other dust control measures to ensure particulate emissions would not leave the construction site. No chemical products would be used to control dust. The Proposed Actions would not have a measurable effect on the air quality of the Academy or surrounding region.

4.1.2 No Action Alternative

No change in air quality would result from implementing the No Action Alternative.

4.2 Geology

4.2.1 Proposed Action

The proposed project would change soil surface characteristics within the RV Storage Lot because the surface would be covered by compacted gravel. The surface would become less permeable; however, the underlying structure would retain its existing characteristics. No other changes to soil would result from implementing the Proposed Action. Loss of permeability would be mitigated by appropriate storm water BMPs

4.2.2 No Action Alternative

No change in air quality would result from implementing the No Action Alternative.

4.3 Water Resources

4.3.1 Proposed Action

The Proposed Action would improve the quality of storm water runoff from the southern part of the RV Parking Lot because post-construction storm water BMPS would be implemented. Past construction of the RV Parking Lot and vehicle impound lot in this area did not include storm water BMPs. Implementation of the Proposed Action would return storm water peak flow runoff rates to pre-development conditions.

4.3.2 No Action Alternative

No change in water resources would result from implementing the No Action Alternative. Storm water runoff rates and volumes would continue to exceed pre-development rates.

4.4 Hazardous Materials and Wastes

4.4.1 Proposed Action

Potential for spills and leaks of fuels, oils, and coolants from construction equipment would increase during the construction period. However, the Academy's Overarching Environmental Specifications and the Construction Permit require contractors to maintain a spill control plan to prevent releases into the environment. The Academy's Environmental Flight responds to spills and maintains cleanup capability. Spills occurring during construction would be cleaned up immediately upon discovery.

The Proposed Action would increase the number of vehicles stored in the RV Parking Lot. Some of the vehicles would contain fuel, oil, and coolant. However, not all of the 266-vehicle increase would contain automotive fluids. A site visit in March 2005 by the Environmental Flight revealed about a third of the vehicles stored in the lot were motorized. The remaining vehicles were RV trailers that do not contain automotive fluids. The ratio of trailers to motorized vehicles would be expected to remain about the same after implementation of the Proposed Action.

The Agency for Toxic Substances and Disease Registry (ATSDR) extensively researched environmental effects from releases of automotive fluids. Appendix D contains excerpts from ATSDR documents describing the degradation potential for gasoline, fuel oil (diesel), used oil, and glycols in soil. The documents show that small quantities of automotive fluids would be expected to readily degrade in soil. Because each vehicle containing these fluids would hold a limited quantity (assuming a maximum fuel tank size of 100 gallons), a catastrophic release causing permanent environment damage would not be expected. Minor leaks and spills would be detected by Services staff conducting monthly inspections of the RV lot. The Environmental Flight would be contacted to manage cleanup of spills and leaks.

4.4.2 No Action Alternative

No change in spill potential from hazardous materials and waste would result from implementing the No Action Alternative.

4.5 Biological Resources

4.5.1 Proposed Action

Limited vegetation would be lost if the Proposed Action were implemented. Areas 1, 2, 3, and 4 are sparsely covered with native grass. No threatened or endangered species habitat would be lost from implementing the Proposed Action.

4.5.2 No Action Alternative

No change in vegetation would result from this action. No change in quantities or types of plant communities represented in the area would result from this action. No change in extent or types of habitats and types and diversity of wildlife would result from this action. No known threatened or endangered species exist within the project area. This alternative would not effect PMJM populations.

4.6 Cultural Resources

4.6.1 Proposed Action

No cultural resources would be adversely affected by the Proposed Action. However, to maintain compliance with the National Historic Preservation Act, trees must be planted along the east side of the RV Parking Lot to screen the area from view. This action would improve cultural resources by providing more screening for the existing lots.

4.6.2 No Action Alternative

No change in cultural resources would result from this action.

4.7 Cumulative Impacts

Construction of the Base Service and Supply Area changed the environmental from a natural prairie setting to an industrial area. Past expansions of the RV Storage Lot in 1993 and 1997 resulted in limited mitigations to prevent environmental degradation. The Proposed Action would not be expected to cause additional detrimental environmental effects. It would improve environmental conditions, provided the terms required by the Construction and MS4 Permits are followed. No future build-out is possible in this area because of PMJM habitat and floodplain boundaries. The El Paso County population is expected to increase in the future; however, no data currently exist to show that Services would request additional RV parking lots.

4.8 Irreversible and Irretrievable Commitment of Resources

NEPA requires that environmental analyses include identification of "…any irreversible and irretrievable commitments of resources that would be involved in the Proposed Action should it be implemented." For the Proposed Action, most impacts are short-term and temporary, or long-lasting, but not significant. Construction and operation of the RV Parking Lot would require the consumption of limited amounts of materials, such as concrete, sand, and steel. An undetermined amount of energy to construct the RV Parking Lot would be expended and irreversibly lost. Implementation of the Proposed Action would not result in the destruction of environmental resources. No wildlife habitat or cultural resources would be lost or adversely affected from implementation of the Proposed Action.

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7.0 References

Base Service and Supply Area Master Plan, US Air Force Academy, 2004 Update

Expand Recreational Vehicle Storage, EA 93-001, USAFA, 26 March 1993

Environmental Assessment for RV Lot Expansion, EA 97-043, USAFA, 30 April 1998

Final Needs Assessment Study Report, USAFA RV Storage Lot Expansion, AFBCIF # 260006, February 2004

No Further Action Decision Document for Site 11, Civil Engineer Maintenance Yard. US Air Force Academy, Colorado Springs, CO. September 2002.

Natural Resource Conservation Service. 1981. Soil Survey of El Paso County Area, Colorado.

United States Air Force Academy. 2003. Integrated Natural Resource Management Plan.

Roy F. Weston, Inc. 2000. Final Environmental Construction Plan for Water Quality Improvements for Base Service and Supply Area Drainages.

Appendix A

Needs Assessment Study
(Click to open)

USAF SERVICES

Combat Support & Community Service

United States Air Force Academy

RV Storage Lot Expansion Needs Assessment Study

U.S. AIR FORCE

Final Report

February 2004

Table of Contents

Historical Operations Analysis

N/A

Existing Site and Facility Analysis

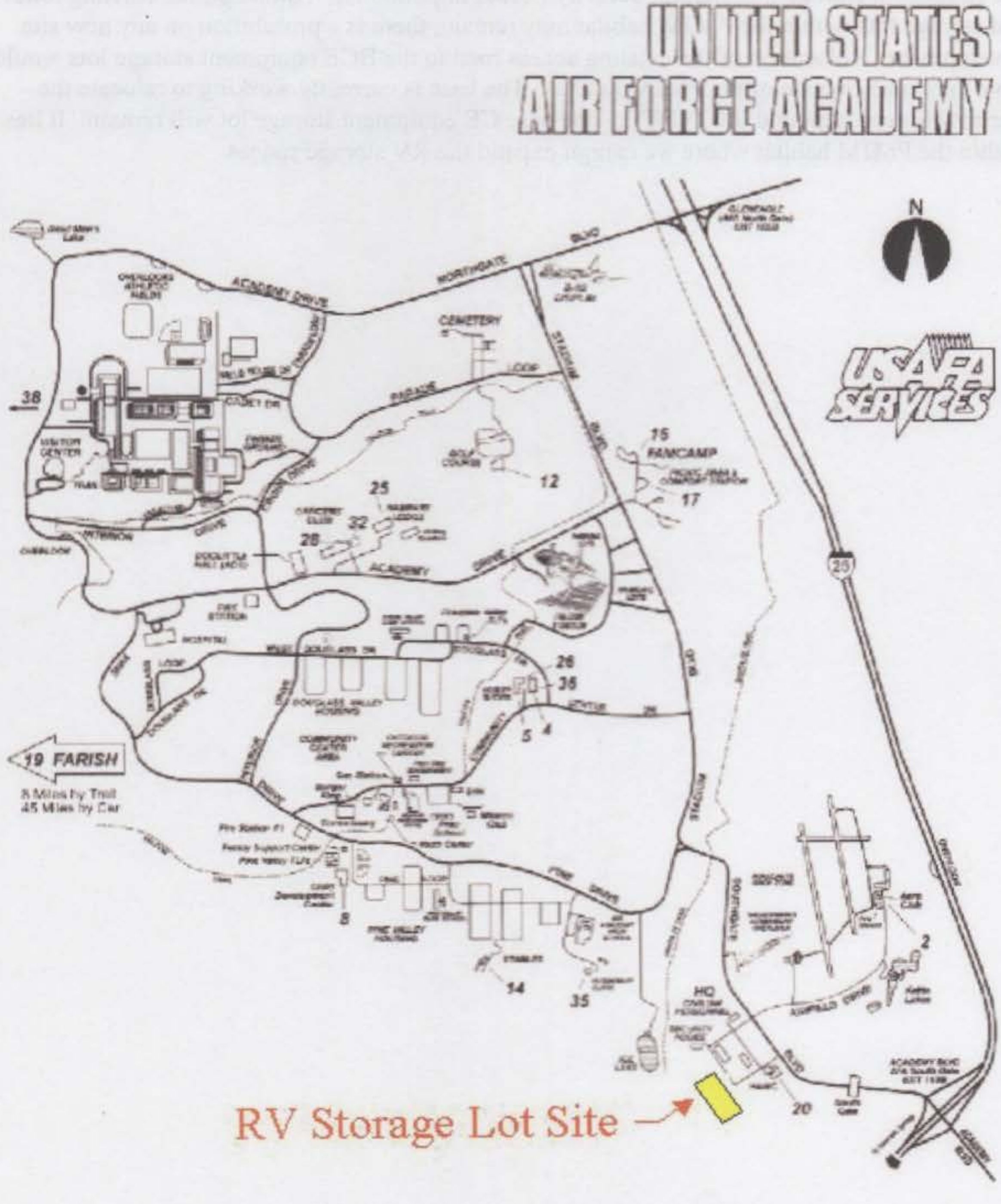
The site visit included an analysis of the existing RV parking facility to assess the present condition and to identify all features. The site and facilities review include:

- The size and capacity of the site;
- The suitability of the layout for proposed functions;
- The visible condition of site; and
- Code and environmental compliance issues.

The results of the site visit and facility analysis:

- The two existing sites are reasonable in terms of size, security, and maneuverability. The facility is divided into two separate, gravel-paved areas approximately 150 feet apart. Both sites are fenced with only minimal lighting provided by lights along the adjoining roads. Access to both of the existing lots is provided through manually operated gates that are secured with a chain and combination padlock.

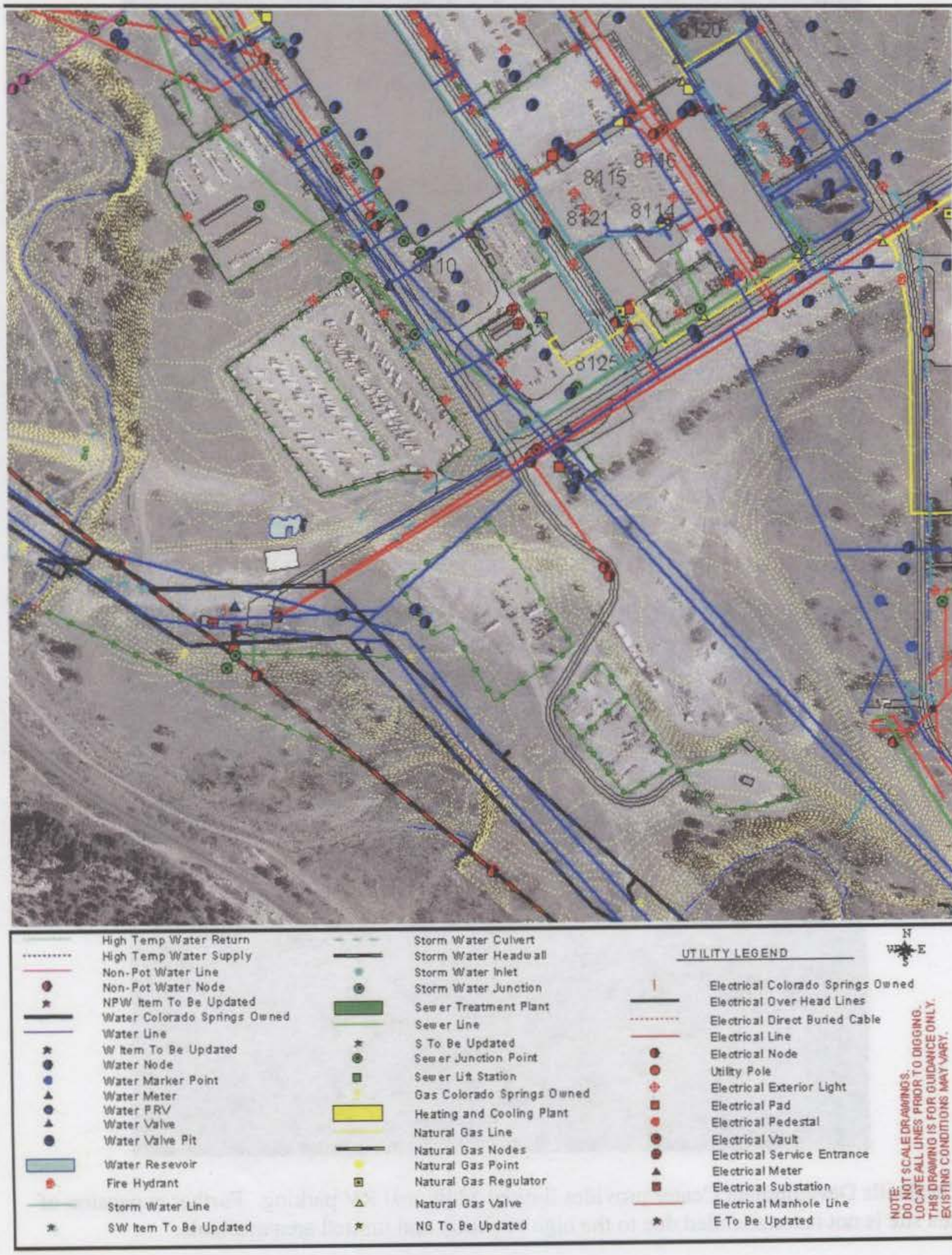
Existing RV storage lots and surrounding base proposed expansion areas conflict with the protected habitat boundary of the Prebles Meadow Jumping Mouse (PMJM), access road to the CE equipment storage lots and the Security Forces impound lot. Although, the existing roads and storage lots within the PMJM habitat may remain, there is a prohibition on any new site development. Relocation of the existing access road to the BCE equipment storage lots would have to remain outside of the PMJM habitat. The base is currently working to relocate the Security Forces impound lot. NOTE: The base CE equipment storage lot will remain. It lies within the PMJM habitat where we cannot expand the RV storage spaces.


UNITED STATES
AIR FORCE ACADEMY
N
USAFA SERVICES
ACADEMY DRIVE
NORTHGATE BLVD
CEMETERY
LOOP
PARADE
CADET DR
STADIUM BLVD
FAMCAMP
GOLF COURSE
ACADEMY DRIVE
FARISH
8 Miles by Trail
45 Miles by Car
HQ
SOUTHGATE
RV Storage Lot Site

The "Natural Resources" site was considered and not selected due to the visibility from IH-25.

The Skills Development Center provides limited additional RV parking. Further expansion of this site is not recommended due to the high visibility and limited area available.

The next several pages show in detail the RV lot expansion plans.



RV Storage Lot Site Utility Map

Market Area Analysis

N/A

Typical competing commercial RV storage facilities in the local area include the paved perimeter areas of mini-storage facilities that are open during the day and crowded, fenced-gravel lots with little vehicle maneuvering room.

Financial Analysis

N/A

General Notes

The design of this facility must comply with all current applicable national, state, local, and military codes, standards, and regulations. The design must also comply with base/MAJCOM design and environmental standards. This proposed concept should consider such regional factors as climate, soil conditions, utility access, and the availability of materials.

The intent of this document is to provide a general description of the facility proposal. The documents do not represent specific national, regional, or local conditions. The base must coordinate and design all systems including civil, architectural, structural, mechanical, electrical, and plumbing for specific national, regional, and local conditions.

Proposed Cost Estimate
USAFA RV Storage Lot Expansion

Item	Quantity	Unit	Unit Cost	Total ($000)
Primary Facility				$422,122
Pavements		LS		(147,000)
Fencing		LS		(60,000)
Retaining Wall		LS		(215,122)
Construction Cost				**$422,122**
Design Fees				44,323
Environmental Testing, Abatement, Permits				30,000
Archeological Monitoring				0
FF&E (Non RPIE)				0
Total NAF Project Cost (Rounded)				**$496,445**

Cost source is PACES 2002. Includes markups as follows: Escalation factor of 10.52% for mid-point construction May 06; General Conditions at 4.39%; Overhead at 5.75% and Profit at 10.50%.

Conclusions and Recommendations

The market for this facility is military personnel and their families living on base, civilian employees, and area retirees. The positive cash flow generated by the RV storage lot indirectly goes to support other Services MWR programs that meet the needs of military personnel. The recommended project scope will support the market demand. The base SVS and BCE should work together to accomplish the facility design.

The existing RV parking facility on the Academy is full to capacity with over 200 names on the waiting list. Recreational vehicle parking is not permitted in the base housing areas. The original base proposed project included a 275 space expansion of the existing facility. A portion of the base proposed expansion area was within the protected habitat of the PMJM and not available for use. This report originally recommended a reduced scope of 168 additional spaces, within the area that is both available and cost effective to develop, for an estimated construction cost of $377,727. This scope was based on area restrictions due to the protected habitat of the PMJM. Based on new habitat boundaries identified in Jan 04, this report now recommends 266 spaces, 400,000 SF at a cost of $496,445. The proposed expansion will utilize the areas that are immediately adjacent to the existing facility that are not within the PMJM protected habitat and are the most cost effective to develop. No alternative locations were identified that were acceptable to base leadership.

The new facility should be an expansion of the existing gravel-paved facility with a security fence. Additional area lighting is not wanted by the base and is not recommended in this study. The storage lot will continue to be accessible 24/7 through manually operated gates that are secured with a chain and combination padlock. This simple access system has worked well over the years and requires no maintenance.

Appendix A

Comments

MEMORANDUM FOR 10 SVS/CD

FROM: 10 CES/CECP

SUBJECT: Review Comments on Draft NAS, RV Storage Lot Expansion Project

1. The following are comments on the draft Needs Assessment Study (NAS) for the FY06 RV Storage Lot Expansion Project.

2. As you are aware, the original scope for this project was to expand the existing storage space by approximately 400,000 sf. When Mr. Buckley conducted his site visit in March 03, Natural Resources presented a preliminary version of revised flood plain and Prebles Mouse habitat boundaries. Consequently, the draft NAS reduced our expansion to 116,154 sf. Mr. Buckley's cost estimate provided for expansion into every available space we were anticipating at that time. It was well done.

3. The final boundary map was obtained and the boundaries were staked. This gave us a very different picture than the draft presented in March. Consequently, the scope of the project has again been modified to reflect actual boundary constraints. The current scope expands the current storage by 184,311 sf into areas not anticipated in the draft NAS. Attachment 1 is a site plan and pictures depicting the revised scope.

4. Attachment 2 is a cost estimate that better reflects the revised scope. A few notes to clarify:

a. The draft NAS provided a retaining wall East of the existing Southwest storage lot. This wall accounted for approximately half of the construction cost in the draft NAS. We have taken this area off the proposed expansion area. The cost does not support the limited space it will provide for storage.

b. There are 6 areas considered for expansion. Each has a cost estimate assigned.

c. Area #1 has a drainage ditch which we propose to keep open. A 15' access road across the ditch with a culvert is proposed to allow access into the area.

d. The existing access road that cuts through Area #5 will be demolished during construction. A new access road can be created around the completed Southern section.

5. There are numerous references to number of parking spaces in the draft NAS. These will all need to be updated to reflect an additional 266 spaces or a total of 664 spaces.

6. Recommended changes to Page 4 of the draft NAS:

a. Change OPTION 3 to read: Build a total of 266 additional RV parking spaces adjacent to two existing lots. The proposed areas do not infringe on surrounding boundary constraints. The gravel-paved lots would be secured with a chain link fence. Additional lighting will not be required and the gates will be secured with a padlock and chain similar to the current operation.

b. Change RATIONALE FOR RECOMMENDED SITING to read: The existing and proposed expansion sites comply with the Base Comprehensive Plan. Additionally, expanding around the existing storage area is the most cost effective option. The proposed expansion does not infringe on surrounding endangered species habitat or the 100 year flood plain.

7. Recommended changes to Page 5 of the draft NAS:

a. Change para #2: Delete reference to the drainage channel and the retaining wall.

b. With revised construction costs and increase in parking spaces, the financial information should change.

8. Recommended changes to Page 9 of the draft NAS:

a. Change the current site map to the one attached.

b. Change the last sentence to read: 'The base is currently working to relocate the Security Forces impound lot. NOTE: The BCE equipment storage lot will remain. It lies within the Prebles Meadow Jumping Mouse habitat where we cannot expand the RV parking.

9. Recommended changes to Page 12 – 15 of the draft NAS:

a. Replace the site pictures with the attached site pictures.

Deven R. Volk,
Senior Program Engineer
10th Civil Engineer Squadron

Attachments:
1. Site Plan with Site Pictures
2. Cost Estimate

Appendix B

Points of Contact

Name	Office	Phone #	E-mail
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Appendix B

2000 Census Data

2000 Census Data

	80908 5-Digit ZCTA, 809 3-Digit ZCTA	80918 5-Digit ZCTA, 809 3-Digit ZCTA	80919 5-Digit ZCTA, 809 3-Digit ZCTA	80920 5-Digit ZCTA, 809 3-Digit ZCTA
Total:	9,222	49,575	28,211	32,007
Hispanic or Latino	293	4,239	1,320	1,762
Not Hispanic or Latino:	8,929	45,336	26,891	30,245
Population of one race:	8,803	44,120	26,357	29,670
White alone	8,586	40,071	24,703	27,554
Black or African American alone	69	1,904	464	941
American Indian and Alaska Native alone	55	281	74	158
Asian alone	68	1,679	1,053	949
Native Hawaiian and Other Pacific Islander alone	4	68	18	29
Some other race alone	21	117	45	39
Population of two or more races:	126	1,216	534	575
Population of two races:	115	1,132	495	543
White; Black or African American	18	225	54	108
White; American Indian and Alaska Native	42	232	99	110
White; Asian	31	338	233	200
White; Native Hawaiian and Other Pacific Islander	11	33	8	17
White; Some other race	6	159	58	45
Black or African American; American Indian and Alaska Native	3	43	11	9
Black or African American; Asian	0	34	7	16
Black or African American; Native Hawaiian and Other Pacific Islander	0	6	0	1
Black or African American; Some other race	1	19	3	8
American Indian and Alaska Native; Asian	0	5	2	3
American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander	0	2	0	0
American Indian and Alaska Native; Some other race	2	10	0	2
Asian; Native Hawaiian and Other Pacific Islander	0	15	10	9
Asian; Some other race	1	11	10	15
Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0

	80908 5-Digit ZCTA, 809 3-Digit ZCTA	80918 5-Digit ZCTA, 809 3-Digit ZCTA	80919 5-Digit ZCTA, 809 3-Digit ZCTA	80920 5-Digit ZCTA, 809 3-Digit ZCTA
Population of three races:	8	75	38	31
White; Black or African American; American Indian and Alaska Native	5	24	18	8
White; Black or African American; Asian	1	11	1	0
White; Black or African American; Native Hawaiian and Other Pacific Islander	0	1	0	0
White; Black or African American; Some other race	0	8	2	1
White; American Indian and Alaska Native; Asian	0	4	3	7
White; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander	1	2	0	0
White; American Indian and Alaska Native; Some other race	0	5	0	0
White; Asian; Native Hawaiian and Other Pacific Islander	0	9	12	8
White; Asian; Some other race	0	7	0	3
White; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	3
Black or African American; American Indian and Alaska Native; Asian	0	2	0	0
Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander	0	0	0	0
Black or African American; American Indian and Alaska Native; Some other race	0	0	0	0
Black or African American; Asian; Native Hawaiian and Other Pacific Islander	1	0	0	0
Black or African American; Asian;Some other race	0	2	2	0
Black or African American; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0
American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander	0	0	0	1
American Indian and Alaska Native; Asian; Some other race	0	0	0	0
American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0

	80908 5-Digit ZCTA, 809 3-Digit ZCTA	80918 5-Digit ZCTA, 809 3-Digit ZCTA	80919 5-Digit ZCTA, 809 3-Digit ZCTA	80920 5-Digit ZCTA, 809 3-Digit ZCTA
Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0
Population of four races:	3	8	1	1
White; Black or African American; American Indian and Alaska Native; Asian	0	2	0	0
White; Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander	0	0	0	0
White; Black or African American; American Indian and Alaska Native; Some other race	0	2	0	0
White; Black or African American; Asian; Native Hawaiian and Other Pacific Islander	3	4	1	0
White; Black or African American; Asian; Some other race	0	0	0	0
White; Black or African American; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0
White; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander	0	0	0	1
White; American Indian and Alaska Native; Asian; Some other race	0	0	0	0
White; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0
White; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0
Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander	0	0	0	0
Black or African American; American Indian and Alaska Native; Asian; Some other race	0	0	0	0
Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0

	80908 5-Digit ZCTA, 809 3-Digit ZCTA	80918 5-Digit ZCTA, 809 3-Digit ZCTA	80919 5-Digit ZCTA, 809 3-Digit ZCTA	80920 5-Digit ZCTA, 809 3-Digit ZCTA
Black or African American; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0
American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0
Population of five races:	0	1	0	0
White; Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander	0	1	0	0
White; Black or African American; American Indian and Alaska Native; Asian; Some other race	0	0	0	0
White; Black or African American; American Indian and Alaska Native; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0
White; Black or African American; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0
White; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0
Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0
Population of six races:	0	0	0	0
White; Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; Some other race	0	0	0	0

Appendix C

Hydrographs and Supporting Data for TR-55 Calculations

Developed HydroCAD Report.mdi

Click to open

Undeveloped HydroCAD Report.mdi

Click to open

Subcatchment 3S: South Lot

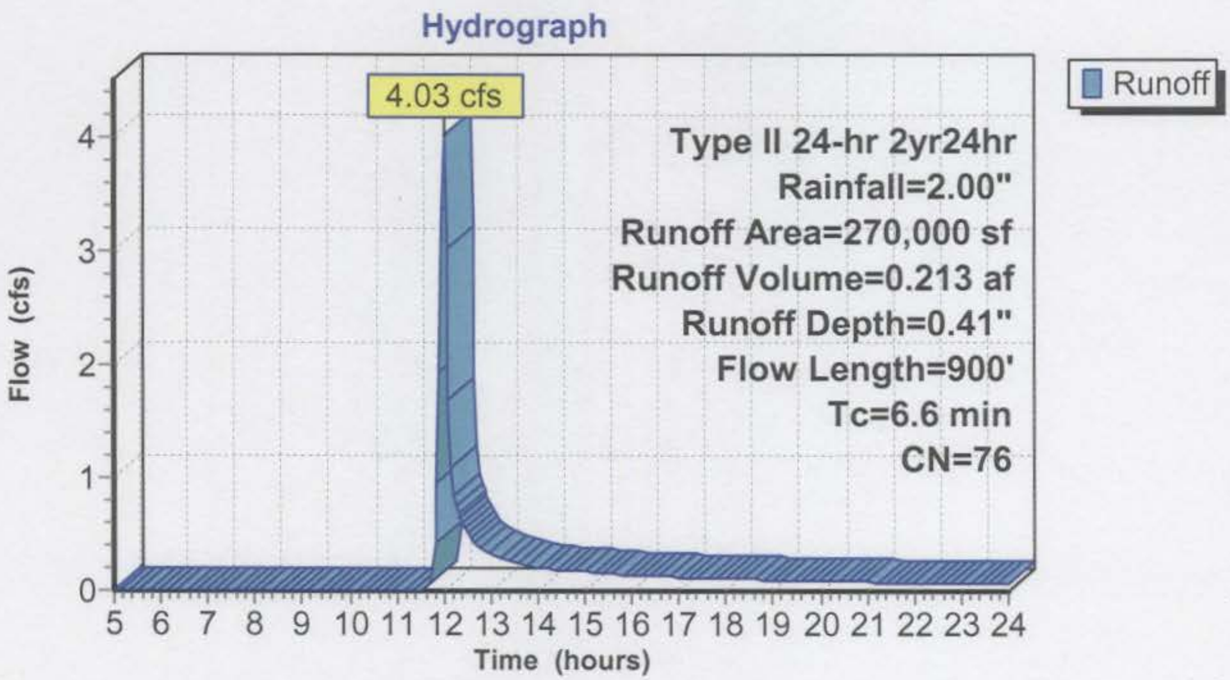
Runoff = 4.03 cfs @ 12.00 hrs, Volume= 0.213 af, Depth= 0.41"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2yr24hr Rainfall=2.00"

Area (sf)	CN	Description
270,000	76	Gravel roads, HSG A

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.6	900	0.0200	2.3		**Shallow Concentrated Flow, Developed** Unpaved Kv= 16.1 fps

Subcatchment 3S: South Lot



Subcatchment 3S: South Lot

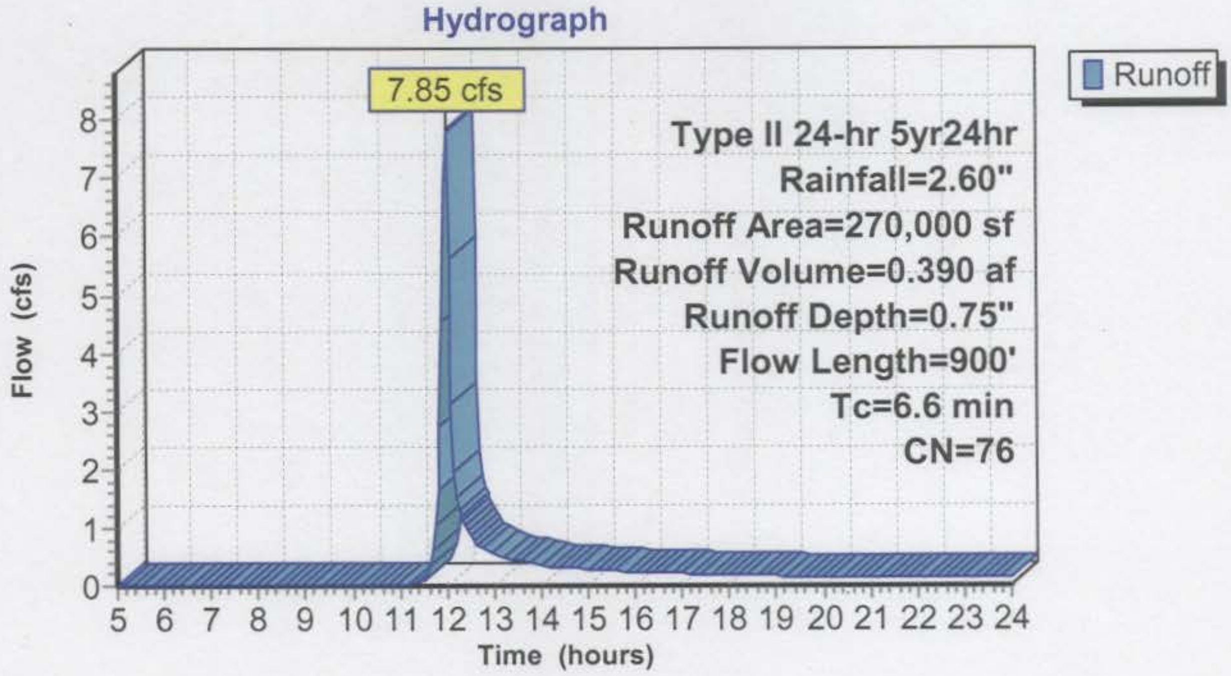
Runoff = 7.85 cfs @ 11.99 hrs, Volume= 0.390 af, Depth= 0.75"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 5yr24hr Rainfall=2.60"

Area (sf)	CN	Description
270,000	76	Gravel roads, HSG A

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.6	900	0.0200	2.3		**Shallow Concentrated Flow, Developed** Unpaved Kv= 16.1 fps

Subcatchment 3S: South Lot



Subcatchment 3S: South Lot

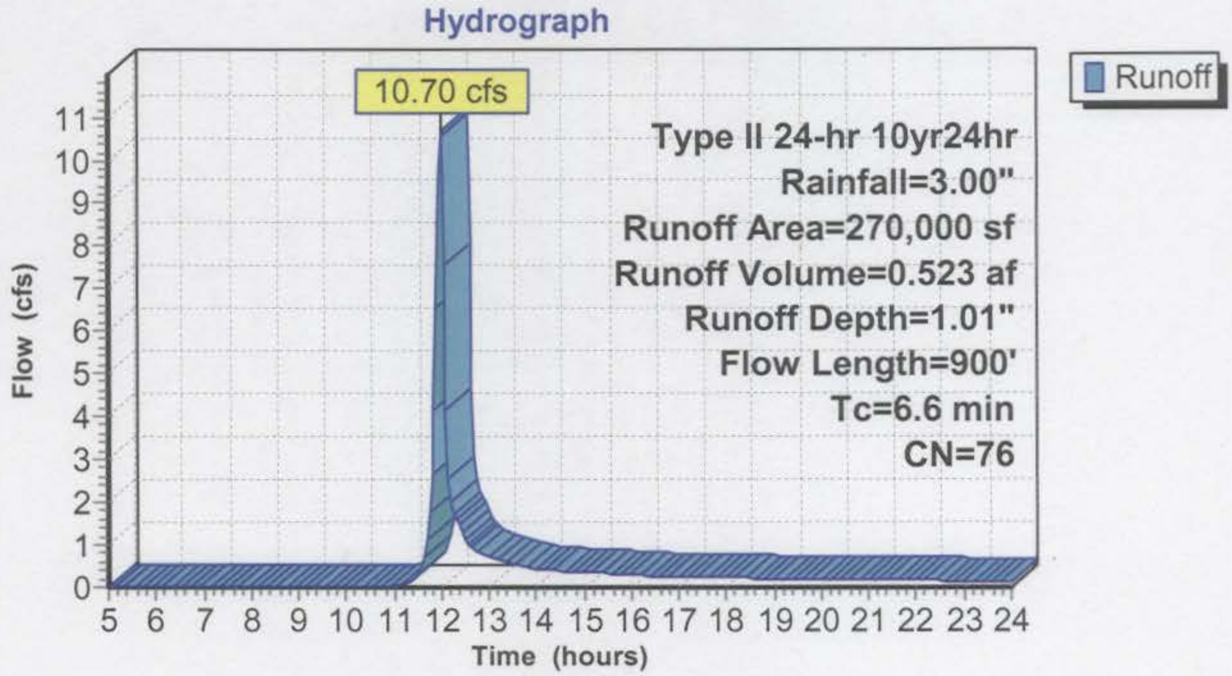
Runoff = 10.70 cfs @ 11.99 hrs, Volume= 0.523 af, Depth= 1.01"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10yr24hr Rainfall=3.00"

Area (sf)	CN	Description
270,000	76	Gravel roads, HSG A

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.6	900	0.0200	2.3		**Shallow Concentrated Flow, Developed** Unpaved Kv= 16.1 fps

Subcatchment 3S: South Lot



Subcatchment 3S: South Lot

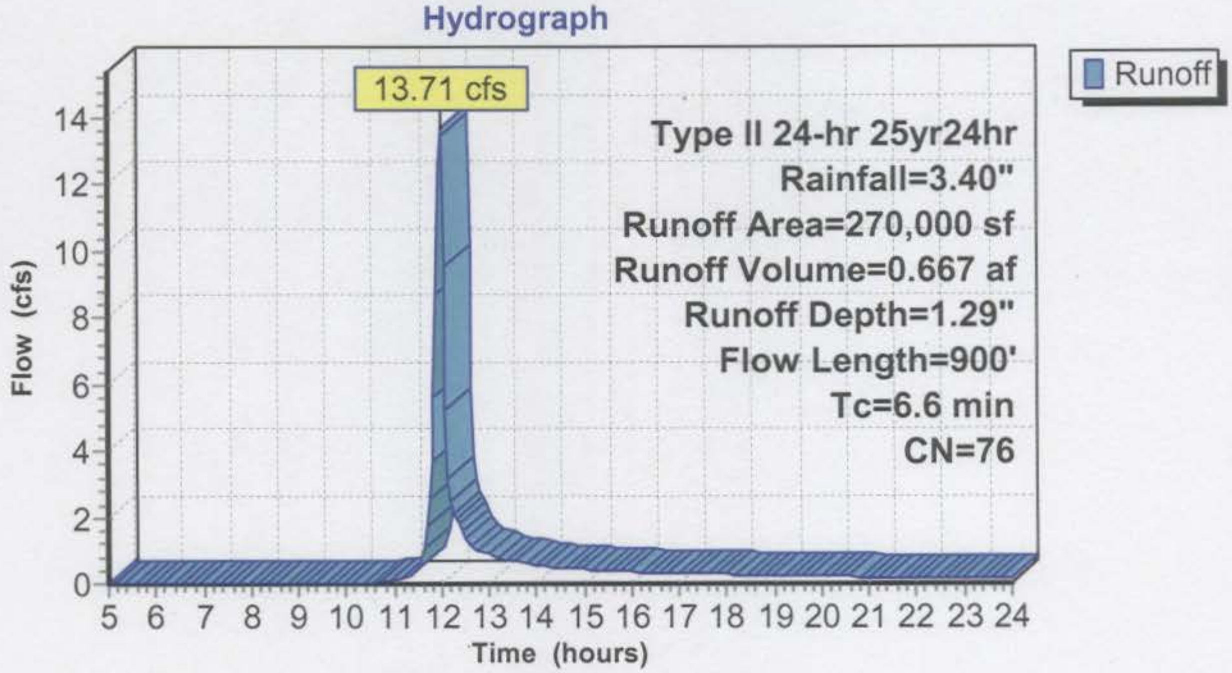
Runoff = 13.71 cfs @ 11.98 hrs, Volume= 0.667 af, Depth= 1.29"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25yr24hr Rainfall=3.40"

Area (sf)	CN	Description
270,000	76	Gravel roads, HSG A

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.6	900	0.0200	2.3		**Shallow Concentrated Flow, Developed** Unpaved Kv= 16.1 fps

Subcatchment 3S: South Lot



Subcatchment 3S: South Lot

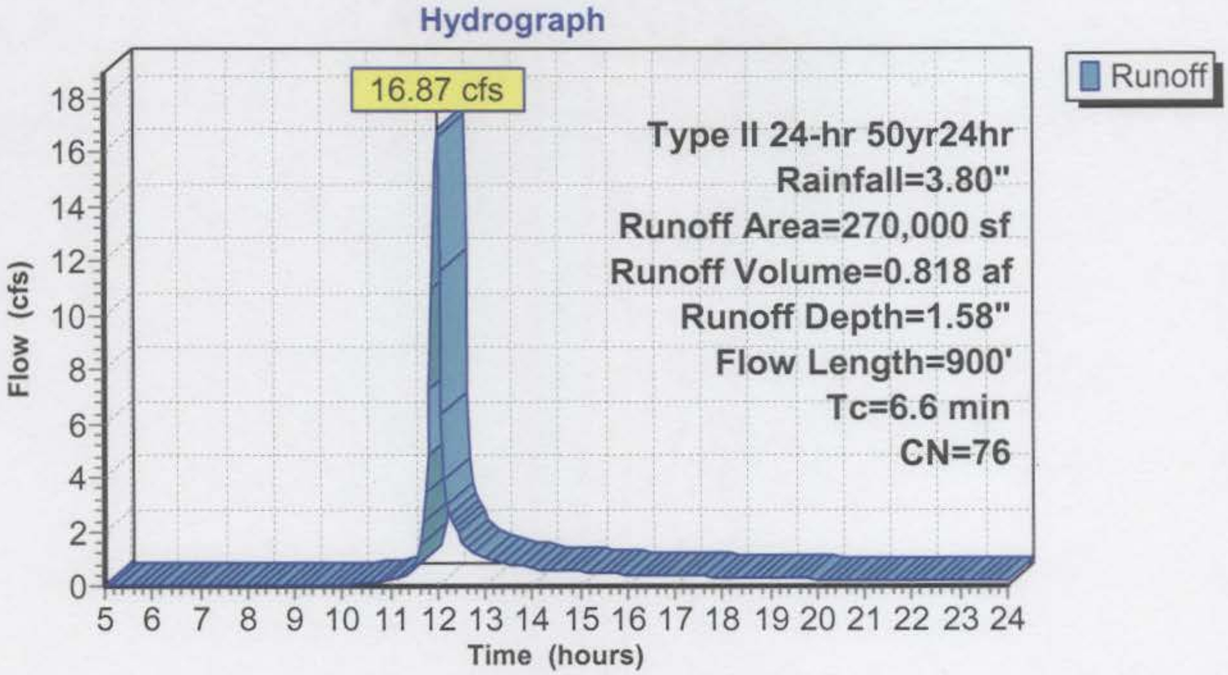
Runoff = 16.87 cfs @ 11.98 hrs, Volume= 0.818 af, Depth= 1.58"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 50yr24hr Rainfall=3.80"

Area (sf)	CN	Description
270,000	76	Gravel roads, HSG A

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.6	900	0.0200	2.3		**Shallow Concentrated Flow, Developed** Unpaved Kv= 16.1 fps

Subcatchment 3S: South Lot



Subcatchment 3S: South Lot

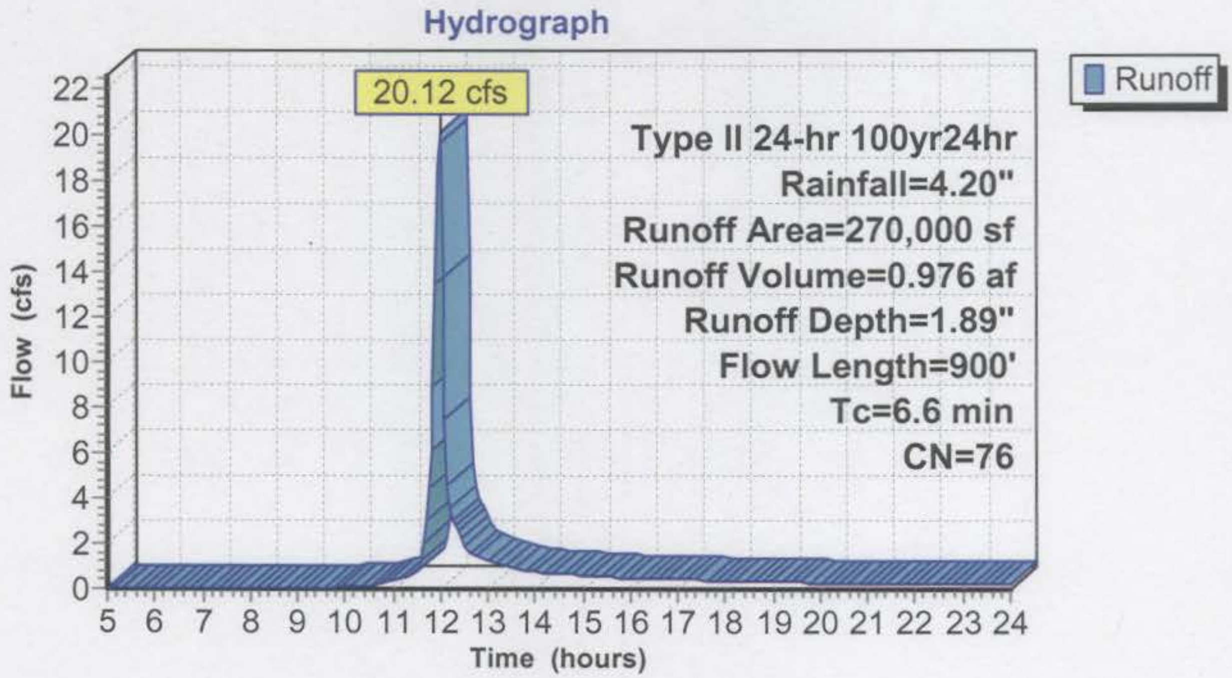
Runoff = 20.12 cfs @ 11.98 hrs, Volume= 0.976 af, Depth= 1.89"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 100yr24hr Rainfall=4.20"

Area (sf)	CN	Description
270,000	76	Gravel roads, HSG A

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.6	900	0.0200	2.3		**Shallow Concentrated Flow, Developed** Unpaved Kv= 16.1 fps

Subcatchment 3S: South Lot



Subcatchment 3S: South Lot

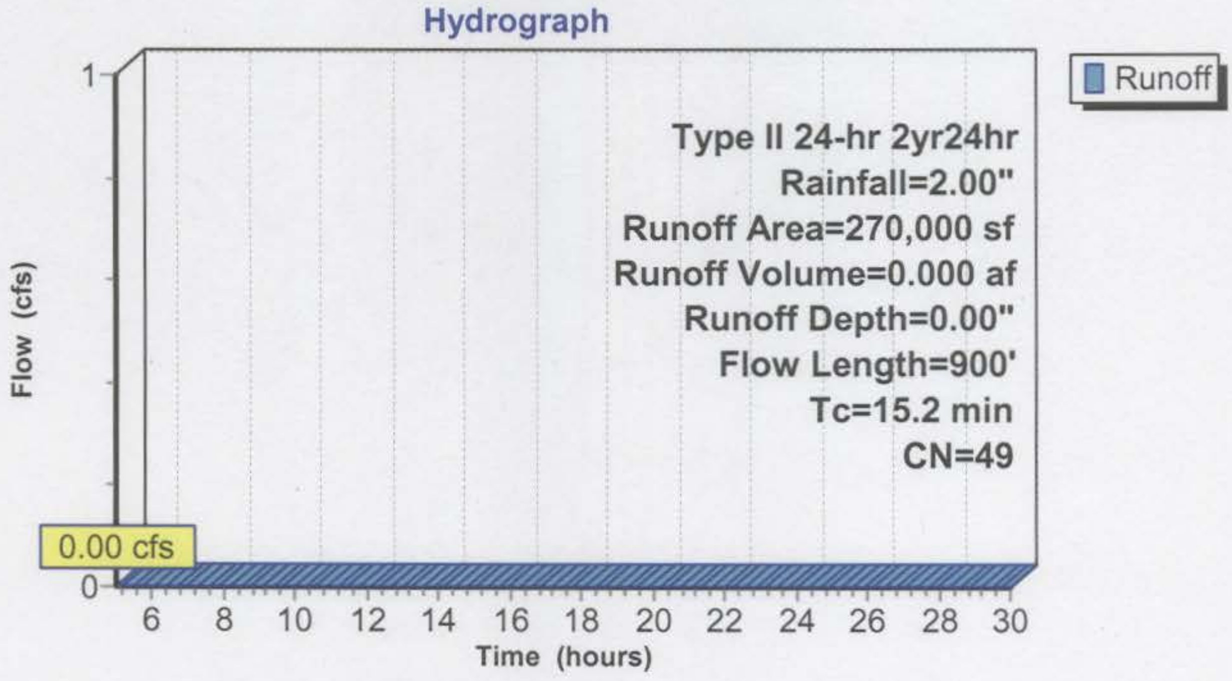
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 2yr24hr Rainfall=2.00"

Area (sf)	CN	Description
270,000	49	Pasture/grassland/range, Fair, HSG A

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.2	900	0.0200	1.0		**Shallow Concentrated Flow, Undeveloped** Short Grass Pasture Kv= 7.0 fps

Subcatchment 3S: South Lot



Subcatchment 3S: South Lot

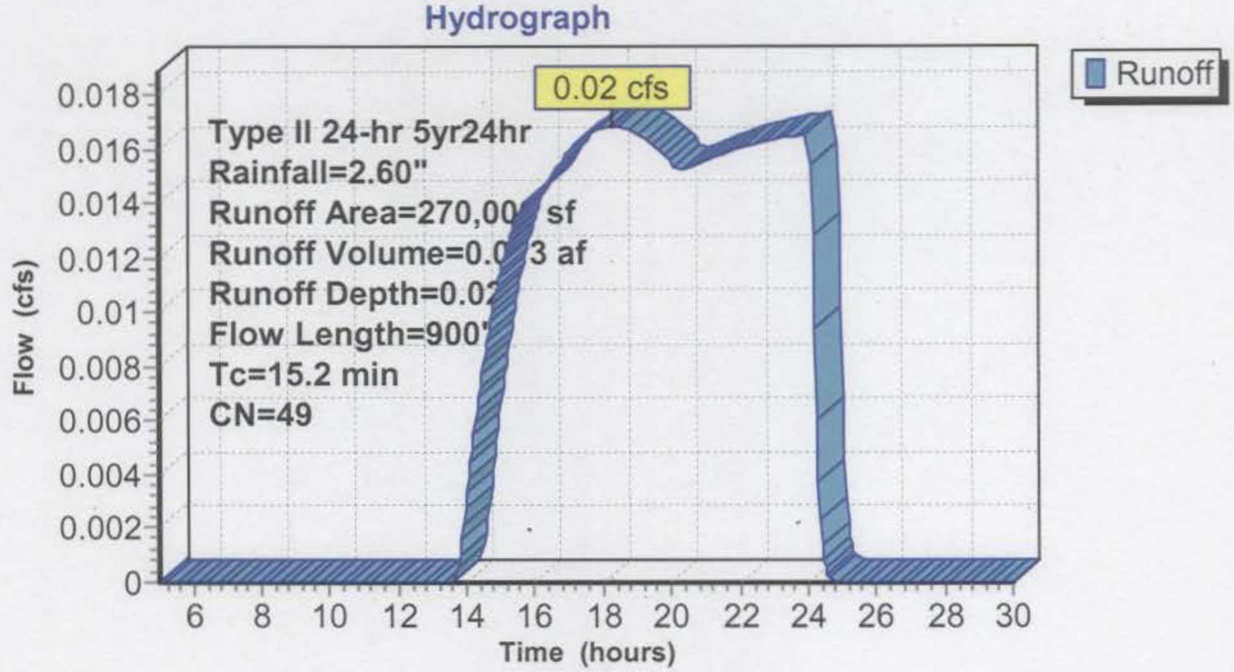
Runoff = 0.02 cfs @ 18.31 hrs, Volume= 0.013 af, Depth= 0.02"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 5yr24hr Rainfall=2.60"

Area (sf)	CN	Description
270,000	49	Pasture/grassland/range, Fair, HSG A

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.2	900	0.0200	1.0		**Shallow Concentrated Flow, Undeveloped** Short Grass Pasture Kv= 7.0 fps

Subcatchment 3S: South Lot



Subcatchment 3S: South Lot

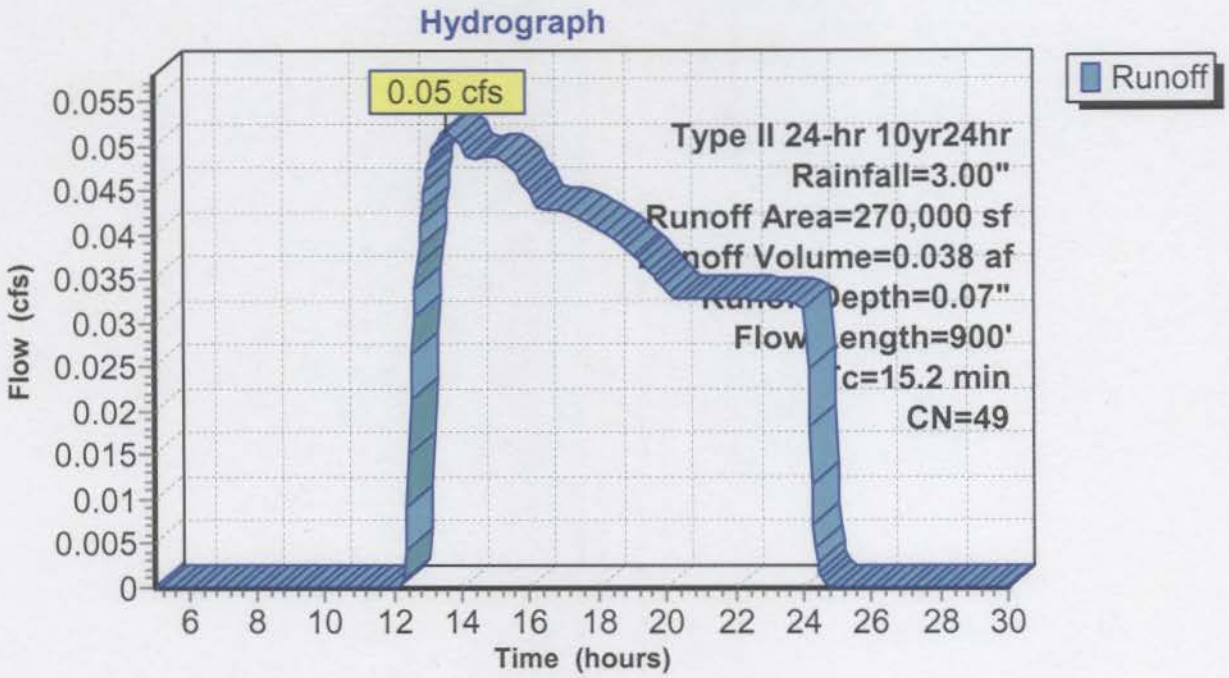
Runoff = 0.05 cfs @ 13.53 hrs, Volume= 0.038 af, Depth= 0.07"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 10yr24hr Rainfall=3.00"

Area (sf)	CN	Description
270,000	49	Pasture/grassland/range, Fair, HSG A

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.2	900	0.0200	1.0		**Shallow Concentrated Flow, Undeveloped** Short Grass Pasture Kv= 7.0 fps

Subcatchment 3S: South Lot



Subcatchment 3S: South Lot

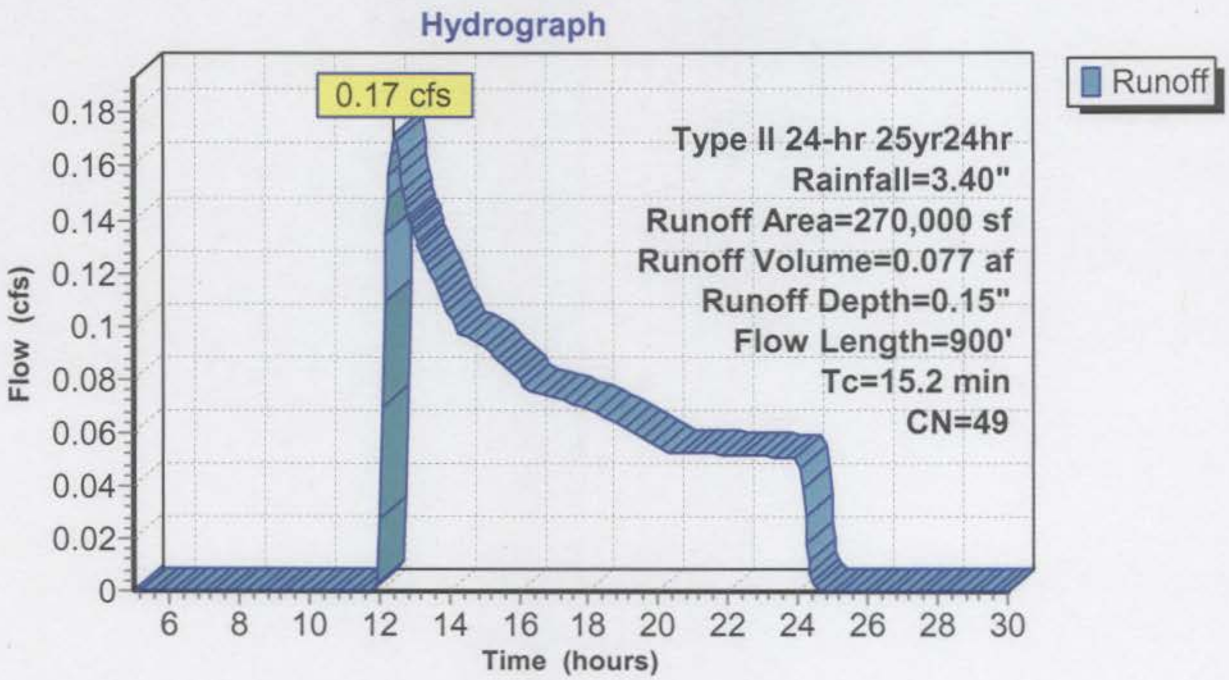
Runoff = 0.17 cfs @ 12.47 hrs, Volume= 0.077 af, Depth= 0.15"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 25yr24hr Rainfall=3.40"

Area (sf)	CN	Description
270,000	49	Pasture/grassland/range, Fair, HSG A

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.2	900	0.0200	1.0		**Shallow Concentrated Flow, Undeveloped** Short Grass Pasture Kv= 7.0 fps

Subcatchment 3S: South Lot



Subcatchment 3S: South Lot

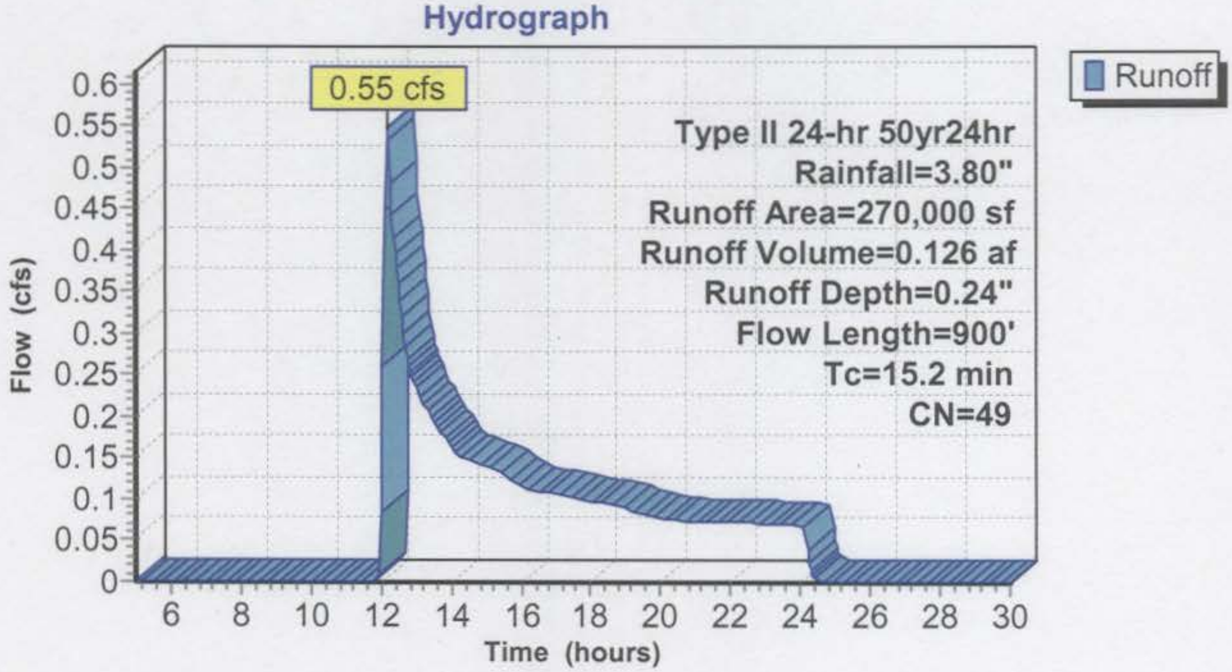
Runoff = 0.55 cfs @ 12.17 hrs, Volume= 0.126 af, Depth= 0.24"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 50yr24hr Rainfall=3.80"

Area (sf)	CN	Description
270,000	49	Pasture/grassland/range, Fair, HSG A

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.2	900	0.0200	1.0		**Shallow Concentrated Flow, Undeveloped** Short Grass Pasture Kv= 7.0 fps

Subcatchment 3S: South Lot



Subcatchment 3S: South Lot

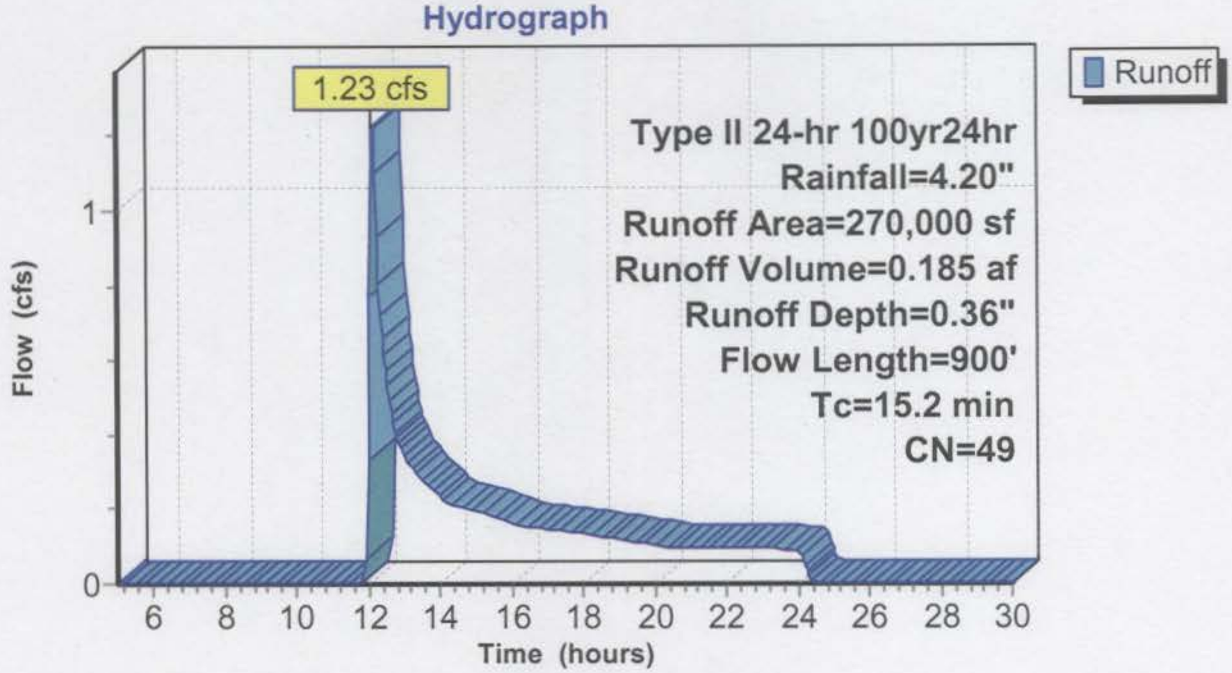
Runoff = 1.23 cfs @ 12.15 hrs, Volume= 0.185 af, Depth= 0.36"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 100yr24hr Rainfall=4.20"

Area (sf)	CN	Description
270,000	49	Pasture/grassland/range, Fair, HSG A

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.2	900	0.0200	1.0		**Shallow Concentrated Flow, Undeveloped** Short Grass Pasture Kv= 7.0 fps

Subcatchment 3S: South Lot



Appendix D

Environmental Fate and Transport Effects

Of

Gasoline, Glycols, Fuel Oil, and Used Oil

GASOLINE

After volatilization, biodegradation and photooxidation are the most important removal mechanisms for gasoline hydrocarbons released to surface soils (Air Force 1989). Photooxidation in surface soils is less important than in surface water environments since infiltration of the liquid product into the soil will limit exposure to solar radiation (Bossert and Bartha 1984). Biodegradation of gasoline hydrocarbons in soil by a diverse group of microorganisms has been reported by numerous investigators (Atlas 1981; Bossert and Bartha 1984; Haines and Alexander 1974; Mann and Gresham 1990; Thomas et al. 1990). Bacteria and fungi appear to be the most important hydrocarbon-utilizing microbes in soils (Atlas 198 1). n-Alkanes, n-alkylaromatics, and aromatics of carbon chain length C10-C22 are the most readily degradable hydrocarbons. n-Alkanes, alkylaromatics, and aromatics above C22 are generally not available for metabolism by soil microbes because of their limited water solubility and solid physical state. Higher molecular weight hydrocarbons sorbed to soil particulates are also generally unavailable for metabolism by microorganisms. Hydrocarbons in the C5-C9 range are biodegradable only at low concentrations since at higher concentrations they exhibit membrane-solvent toxicity to soil microbes and are generally removed by volatilization. Hydrocarbons with condensed ring structures, such as polyaromatic hydrocarbons (PAHs), and cycloalkanes are relatively resistant to biodegradation (Atlas 1981; Bossert and Bartha 1984). Isoalkanes and 1,3,5- trimethylbenzene have aiso been reported to be resistant to biodegradation (Mann and Gresham 1990). Some of the intermediate products of metabolism (e.g., alcohols, aldehydes, and monocarboxylic acids) are more water soluble or strongly sorbed than the parent hydrocarbons (Atlas 1981; Bossert and Bartha 1984; Carlson 1981). The rate of biodegradation is highly dependent upon the amount of the hydrocarbon substrate and a number of site-specific environmental factors, including temperature, oxygen content, moisture content, nutrient content, salinity, and pH (Atlas 1981; Bossert and Bartha 1984). Degradation of hydrocarbons by soil microbes appears to be almost exclusively an aerobic process. The initial steps in microbial metabolism require oxygen; reference to biodegradation under anaerobic conditions is limited (Atlas 1981; Bossert and Bartha 1984; Corapcioglu and Hossain 1990).

Propylene and Ethylene Glycol

Biodegradation by a variety of microorganisms under both aerobic and anaerobic conditions is also the most important transformation process for ethylene glycol in soils, with a half-life similar to or less than that in surface waters (EPA 1987a). In a laboratory study, soil microbes of the genera Pseudomonas, Citrobacter, and Serratia degraded ethylene glycol, at solution concentrations of 1-3%, within 3 days; concentrations higher than 5% were toxic to the microbes (LDOTD 1990). The soil microbe Clostridium glycolicum degraded ethylene glycol under anaerobic conditions to acid and alcohol end products (Gaston and Stadtman 1963). The rate of biodegradation of ethylene glycol in simulated subsurface soils are dependent on substrate concentrations, soil types, and ambient soil temperatures, but nutritional supplements had minimal effects (McGahey and Bouwer 1992). Greater than 95% removal was

consistently accomplished in <5 days and 7 days at ethylene glycol concentrations of 100 ppm and 1,000 ppm, respectively; however, substrate concentrations of 10,000 ppm showed negligible loss of ethylene glycol. Soils with high organic matter, and thus enhanced microbial diversity and activity, also degraded ethylene glycol significantly faster. A doubling in the degradation rate was also observed with a 10 °C increase in soil temperature. McGahey and Bouwer (1992) concluded that microorganisms naturally occurring in soils and groundwater are effective in biodegrading ethylene glycol with the half-life ranging from 0.2 to 0.9 days. Klecka et al. (1993) studied the biodegradation of aircraft de-icing fluids in soils adjacent to airport runways at various ethylene glycol concentrations and at various temperatures ranging from -2 to 25 °C. Generally, the rate of biodegradation of ethylene glycol was faster in soils with low glycol concentrations, high organic carbon content, and higher ambient soil temperatures (in the range of -2 to 25 °C). Ethylene glycol present in soils at concentrations <6,000 mg/kg (ppm) biodegraded at an average rate of 3.0 mg/kg (ppm) soil /day at -2 °C, at 19.7 mg/kg (ppm) soil/day at 8 °C, aud at an average rate of 66.3 mg/kg (ppm) soil/day at 25 °C (Klecka et al. 1993). Based on these results, biodegradation is expected to play a major role in removing ethylene glycol residues from soils adjacent to airport runways and taxiways. As in surface waters, abiotic transformation of ethylene glycol in soil is not expected to be a significant process (EPA 1987a).

Biodegradation by a variety of microorganisms under both aerobic and anaerobic conditions is also the most important transformation process for propylene glycol in soils, with half-lives similar to or less than those in surface waters (EPA 1987a). The soil microbe C. glycolicum degraded propylene glycol under anaerobic conditions to acid and alcohol end products (Gaston and Stadtman 1963). Ouattara et al. (1992) reported anaerobic degradation of propylene glycol by strains of the sulfate-reducing bacteria Desulfovibrio isolated from anoxic soil of a rice field. Propylene glycol was degraded to acetate in the presence of sulfate with the production of carbon dioxide. The rates of biodegradation of propylene glycol in soils are significantly dependent on substrate concentrations, soil types, and ambient soil temperatures, but nutritional supplements had minimal effects (Klecka et al. 1993). Generally, the rate of propylene glycol biodegradation was faster in soils with low glycol concentrations, high organic carbon content, and higher ambient soil temperatures (in the range of -2-25 °C). Propylene glycol present in soils at concentrations <6,000 mg/kg (ppm) biodegraded at an average rate of 2.3 mg/kg soil/day at -2 °C, 27.0 mg/kg (ppm) soil/day at 8 °C and at an average rate of 93.3 mg/kg (ppm) soil/day at 25 °C (Klecka et al. 1993). Based on these results, biodegradation is expected to play a major role in removing propylene glycol residues from soils adjacent to airport runways and taxiways. As in surface waters, abiotic transformation of propylene glycol in soil is not expected to be a significant process (EPA 1987a).

Fuel Oils

Microbial degradation in soils is greatest for the aromatic fractions of fuel oils, while the biodegradation of the aliphatic hydrocarbons decreases with increasing carbon chain length. Evaporation is the primary fate process for these aliphatics (Air Force 1989).

A single application of approximately 21, 14, or 13 g/kg soil of home heating oil no. 2 to outdoor plots in Pennsylvania (silt loam), Oklahoma (sandy loam), and Texas (clay loam) was degraded by 86%, 90%, and 86%, respectively, after 1 year, with degradation being independent of temperature differences. Very little oil was present in runoff and leachate water from the sites; however, analysis of ether-extractable compounds in the leachate at the plots suggested that incomplete degradation of some individual components in the oils was taking place. Of the six oils tested, no. 2 home heating oil resulted in the largest increase in the number of hydrocarbon-utilizing microorganisms in the plots, and it was the most lethal to soil nematodes (Raymond et al. 1975, 1976). The degradation of kerosene in soil was further studied when a pipeline ruptured and showered a wheat field with kerosene. After 6 months, the kerosene concentration began to decrease in the upper 30 cm of soil (with C13-Cl7 *n*-alkanes disappearing more rapidly compared with C10-C12 *n*-alkanes) and at 21 months was reduced to trace amounts; however, kerosene was still detected at soil depths of 30-45 +cm. The authors interpreted this as indicating reduced aerobic biodegradation at this depth, especially since the compounds disappeared in the order of their preferential microbial utilization. Seed germination studies using the contaminated soil 1 year after the spill (0.34% kerosene concentrations) showed that kerosene delayed seed germination but that the percent germination was unaffected (Dibble and Bartha 1979). Landfarming techniques (tillage of soil using agricultural implements), developed in the Netherlands to enhance biodegradation of contaminants, demonstrated that after one growing season, kerosene (initial concentration of l,000-10,000 mg/kg dry matter) was significantly degraded (final concentration of 500 mg/kg dry matter) in 40 cm of soil (Soczo and Staps 1988). Application of diesel oil or fuel oil (type unspecified) to soil at 1% or 10% showed that, based on carbon dioxide evolution, degradation did occur. After 12 weeks, the applications of 1% diesel oil and fuel oil were degraded by 45% and 23%, respectively, whereas the 10% applications showed that only 10% of each oil was degraded in this time. Carbon dioxide evolution did not increase with increasing time, indicating that microbial populations were not increasing (Flowers et al. 1984). Addition of nitrogen (as urea) to the soil increases the biodegradation potential of diesel oil and kerosene; however, both oils were found to inhibit the urease activity of soil microbes by up to 47% and 35%, respectively, suggesting that sources of nitrogen other than urea should be used (Frankenberger 1988). The bacterial species in the genera *chromobacter, Pseudomonas,* and *Alcaligenes*, isolated from the soil of an active oil field in Louisiana, were able to aerobically degrade kerosene as determined by oxygen uptake (Cooper and Hedrick 1976). Soil *Pseudomonas* were able to degrade kerosene to a greater extent than were *Enterobacter* with stationary phases occurring after 10 days and 8 days, respectively (Butt et al. 1988). Seven years after the dumping of sludge containing kerosene at two sites, vegetation at each site showed little recovery. Although the bacterial biomass had declined at both sites, microbial activity, as determined by carbon dioxide evolution, was greater at the site that had received more precipitation and had the more aerated soil (Jones 1977). Oxidation of kerosene (fuel oil no. 1) and diesel fuel (fuel oil no. 2) by soil microbes, as determined by dehydrogenase activity, increased with increasing loading rates for both fuel oils (up to 60% w/w oil/dry soil) for up to 7 days of incubation but decreased thereafter. Dehydrogenase activity in soil treated with diesel fuel was almost twice that of soils treated with kerosene (56 and 32 pg formazan/g soil/24 hours, respectively) (Frankenberger and Johanson 1982). Biodegradation of fuel oils in

sediments is inhibited under anaerobic conditions (Bartha and Atlas 1977). Under anaerobic conditions, some soil microorganisms are capable of nitrate reduction using fuel oils as the carbon source, although nitrite may be an unwanted by-product. However, the addition of a small amount of oxygen (0.2 volume percent oxygen) to the medium can accelerate the degradation of the oil without the concomitant production of nitrite (Riss and Schweisfurth 1987). Thirteen months after the spill in 1988 of 230,000 gallons of Bunker C fuel oil off the Washington coast, only trace levels of oil were found in surface sediments (Strand et al. 1992).

Used Oil

Studies have shown that used lubricating oil when applied to soil degrades without significant contamination of the surrounding soil and groundwater. This degradation is due to bacteria and fungi which can degrade the components of used lubricating oil (Neal et al. 1977; Rittmann and Johnson 1989). The degradation process is faster when the oil is applied to soil that has been previously exposed to oil due to the increased numbers of the degrading bacteria (Rittmann and Johnson 1989). To increase the degrading ability of the soil, oil-degrading bacteria that have been cultured in a lab can be applied to the soil. The speed of the degradation process decreases after a period of time due to the increase in concentrations of oil components that are harder to degrade (Rittmann and Johnson 1989). Another method of increasing the degradation of oil involves the addition of nitrogen and phosphorus to the soil (Neal et al. 1977; Rittmann and Johnson 1989). An oil decomposition rate of approximately 1 pound per cubic foot of soil per month was recorded in one study when commercial fertilizers were added to the soil (Neal et al. 1977). Additional increases in the rate of degradation can be obtained by tilling the soil to provide aeration (Elsavage and Sexstone 1989; Raymond et al. 1976; Rittmann and Johnson 1989). A study of soil degradation of waste oil emulsion used as a coolant showed a 96% decrease in the concentration of pristane and hexadecane. This decrease was not seen in sterilized soil. Soil with a higher rate of hexadecane biodegradation also showed a corresponding higher rate of respiration. The fatty acids contained in the waste emulsion were broken down within 28 days. Plants were observed to grow on the soil immediately after cessation of the oil application, although it must be noted that in this study the waste oil did not contain the metals found in waste crankcase oil. In soil cores, the majority of the applied compounds remained within the top 48 cm, and the components were not detected in significant concentrations in the groundwater below the site (Elsavage and Sexstone 1989).

Appendix E
SHPO Coordination Letter

DEPARTMENT OF THE AIR FORCE

10TH MISSION SUPPORT GROUP
USAF ACADEMY COLORADO

22 APR 2003

Mr. Rolland N. Olson
Deputy Civil Engineer, 10th Civil Engineer Squadron
8120 Edgerton Drive, Suite 40
USAF Academy CO 80840-2400

Ms. Georgi Contiguglia
Colorado Historic Society
1300 Broadway
Denver CO 80203-2137

Dear Ms. Contiguglia

Please find attached for your review our project to expand the current RV Storage Lot in the Supply & Services area of the Air Force Academy. The location of the facility is in a low lying area and visually screened from all major roadways. Photos of the current lot are also attached (Atch 2). As part of the project, previous mitigation to install small shrubs for screening along the eastern side of the site will be extended. The height of RV vehicles is not expected to exceed the current height of those already stored within the area. No archaeological or paleological sites have been identified in the area of expansion. As a result, we anticipate no impact to cultural resources as a result of this project.

If you have any questions, please contact our Community Planner, Ms. Kit Roupé, at 719-333-8408. We appreciate your review and assistance.

Sincerely

ROLLAND N. OLSON, PE

Attachments:
1. Site Plan
2. Site Photos

I concur ______ Deputy Date May 1, 2003
State Historic Preservation Officer

Commitment To Excellence